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THE PAPER TRADE JOURNAL.

"The Consumption of Paper is the Measure of a People's Culture."

VOLUME XXVIII.—NO. 7. NEW YORK, FEBRUARY 18, 1899. WHOLE NUMBER 1294.

AMERICAN PAPER AND PULP ASSOCIATION.

THE TWENTY-SECOND ANNUAL MEETING HELD THIS WEEK AT THE WALDORF-ASTORIA.

In Session Two Days—The Attendance Large and Meeting Successful—Reports from Divisions of the Trade—Papers on Water Power, Forestry, Chemistry and Industrial Combination—Details of the Proceedings—The Banquet—Speakers and Speeches.

The twenty-second annual meeting of the American Paper and Pulp Association was held at the Wadorf-Astoria hotel, New York, on Wendesday and Thursday, February 15 and 16, 1899.

The meeting was called to order at 11 A. M. on Wednesday by President Hugh J. Chisholm. The reading of the minutes of the last meeting was dispensed with.

Among those present were:

B. H. Snell, Racquette River Paper Company, Potsdam, N. Y.
F. L. Dewey, Racquette River Paper Company, Potsdam, N. Y.
A. F. Holden, Little Falls Paper Company, Newburgh, N. Y.
B. D. Rising, Mittineague Paper Company, Mittineague, Mass.
Frank Grubb, Frank Grubb & Co., New York.
E. F. Birmingham, Dexter Sulphite Pulp and Paper Company, Dexter, N. Y.
Wm. D. Russell, New York.
J. R. Loomis, New York.
J. C. Morgan, Niagara Falls.
W. Lesser, Hudson River Aniline Color Works, Albany.
Jas. N. Mohr, Reading Paper Mills, Philadelphia.
Alex. M. Orr, Orr & Co., Troy.
A. Weeks, St. Louis, Mo.
Geo. H. Parks, International Paper Company, New York.
S. Goldman, A. Wertheim & Co., New York.
L. Suteliff, A. Klipstein & Co., New York.
N. J. Van Patten, Champ Manufacturing Company, Burlington, Vt.
C. M. Hyde, New York.
R. Brodix, New York.
Thos. H. Savery, Harper's Ferry Paper Company, Wilmington, Del.
W. H. Savery, Shenandoah Pulp Company, Wilmington, Del.
Thos. H. Savery, Jr., Wilmington, Del.
E. T. Wilkinson, Wilkinson Brothers, New York.
G. C. Sherman, Taggart Paper Company, Watertown, N. Y.
E. C. Robertson, Robertson Brothers, Hinsdale, N. Y.
G. F. Underwood, International Paper Company, New York.
W. H. Tolman, New York.
A. B. Daniels, L. L. Brown Paper Company, Adams, Mass.
Jno. G. Swann, Engineering News, New York.
Thos. Barrett, Thomas Barrett, New York.
Wellington Smith, Smith Paper Company, Lee, Mass.
H. R. Blethen, the Scranton Supply Company, Scranton, Pa.
W. T. Van Loan, National Cash Register Company, New York.
H. E. Schell, National Cash Register Company, New York.
N. T. Pulsifer, Oakland Paper Company, Manchester, Conn.
Chas. Beebe, Maryland Clay Company, New York.
Edwin Riley, Chisholm, Me.
F. H. Fox, Glens Falls, New York.
A. C. Hastings, Cliff Paper Company, Niagara Falls.
A. H. Chatfield, the Chatfield & Woods Company, Cincinnati.
M. S. Flutt, New York.
H. Duncan, the Duncan Company, Mechanicsville, N. Y.
Chas. H. Dobilinski, Lambertville, N. J.
O. H. Miller, The Central Ohio Paper Company, Columbus, Ohio.
W. H. Parsons, New York.
Col. A. G. Paine, New York and Pennsylvania Company, New York.
C. E. Bush, Ticonderoga Paper and Pulp Company, Ticonderoga, N. Y.
W. V. Wentworth, Ticonderoga Paper and Pulp Company, Ticonderoga, N. Y.
A. A. Burbank, International Paper Company, New York.
W. R. Sheffield, Wilkinson Brothers, New York.
Chas. H. Green, International Paper Company, New York.
B. A. Carr, International Paper Company, Fort Edward, N. Y.
C. F. Logan, Roaring Spring, Pa.
C. C. Walden, United States Paper Maker, New York.
H. W. Hillman, General Electric Company, Schenectady, N. Y.
J. W. French, Michigan Wood Pulp Company, Three Rivers, Mich.
Jos. P. Lewis, Jos. P. Lewis Company, Beaver Falls.
L. O. Post, Paper Mill, New York.
Frank W. Fletcher, Fletcher Paper Company, Alpena, Mich.
F. M. Burdick, Gouverneur Wood Pulp Company, Gouverneur, N. Y.
J. F. Ackerman.
Augustus H. Ivins, Traders Paper Company, Lockport, N. Y.
F. S. Van Vleck, Manhattan Rubber Company, New York city.
H. W. Newton, Martin Kalbfleisch Chemical Company.
Clarence Beebe, Ira L. Beebe Company, New York city.
Geo. W. Hammond, Forest Paper Company, Yarmouthville, Me.
James Conley, Manufacturing Investment Company, Madison, Me.
Allan M. Fletcher, Fletcher Paper Company, Alpena, Mich.
Geo. M. Rafter.
W. M. Deutsch, Continental Filter Company, New York.
H. E. Osborne, New York.
F. W. Wilson, New York.
F. Harwood, Appleton Woolen Mills, Appleton, Wis.
Geo. Hitchcock, Appleton Woolen Mills, Appleton, Wis.
Fred. M. Hille, Raquette River Pulp Company, Gouverneur, N. Y.
Rudolph Roode, International Paper Company, Glens Falls, N. Y.
E. H. Clapp, Penobscot Chemical Company, Boston, Mass.
A. W. Clapp, Penobscot Chemical Company, Boston, Mass.
A. Huggin, Milwaukee Sentinel, Milwaukee, Wis.
Benj. F. Reist, Morrison & Cass Paper Company, Tyrone, Pa.
Jas. B. Forsythe, Stone & Forsythe, Boston.
F. S. Coolidge, International Paper Company, Glens Falls, N. Y.
E. W. Milliard, Waltham, Mass.
C. H. Delano, Penobscot Chemical Fibre Company, Penobscot, Me.
C. M. Sherman, Brownsville Iron Works, Watertown, N. Y.
Chas. S. Barton, Rice, Barton & Fales, Worcester, Mass.
Seth Sprague, New York.
N. M. Jones, Katahdin Paper and Pulp Company, Lincoln, Me.
Wm. H. Claflin, Wm. H. Claflin Company, Boston.
E. P. Lindsay, Odell Manufacturing Company, Boston.
Max Lowenthall, electrical engineer, New York.
W. W. D. Jeffers, International Paper Company, New York.
Geo. N. Megargee, Megargee Paper Mills, Philadelphia.
A. S. Capehart, Director Liberal Arts, Paris Exposition Commissioner, New York.
F. M. Van Wormer, Sandy Hill Iron and Brass Works, Sandy Hill, N. Y.
Jno. W. Flint, Wyman, Flint & Sons Company, Bellows Falls, Vt.
Geo. Russell, Boston.

President Chisholm then read his annual report, as follows:

PRESIDENT'S REPORT.

It was a fact much commented upon at our last meeting that death had never invaded the ranks of the ex-presidents of this Association. For twenty years the office has been handed down to one and another of the prominent men in the industry who, at the time of the assumption of office had already in most cases reached ripe years, and yet the twentieth anniversary found all our ex-presidents surviving. But now the spell is broken, and in quick succession two of my most respected predecessors have been taken from us. Their lives had been devoted to the upbuilding of the paper industry. The name of Byron Weston is inseparably associated with that branch of the industry with which he was connected. So, too, will the Honorable William A. Russell always be looked upon as one of the most successful manufacturers. As men of affairs they both met with marked success, and each had a personality which will make his name cherished by all those with whom he came in contact.

The business year has been for the paper industry a reasonably satisfactory one. At the time of our last meeting the first act was enacted in the war with Spain. You will remember how we were thrilled by the news of the destruction of the Maine. The war is now happily at an end, and we are on the threshold of a period of national expansion. Similarly, the paper industry began the year with that keen competition which has been so characteristic of the past decade, but the year closes with promises of great growth in our industry, due to our sharing in the general commercial expansion of the country at home and abroad. The situation surely is ripe for a great increase in exports of all lines of paper.

The growth of this Association has been commensurate with the growth of the industry. It has been the aim of the officers, past and present, to make the Association a representative one, so that those who wish to accomplish anything for the general welfare of the industry will naturally use it as a medium. If we have done this we have provided the industry with means for exerting an influence outside of its own field whenever occasion may require, and it remains only for the industry to continue loyally to support the organization. I am speaking now not only of the work of the past two years, but also of the several years which preceded them, each administration having contributed in its own way to bring about the present healthy condition of the Association.

But that there is much left to be done to put the Association on a basis so that it can utilize all the opportunities which offer for it to serve the interests of the industry behind it should not be lost sight of.

The Secretary will allude to some of the work that has been done during the past year, and will show also what need there is for a more permanent form of organization, for a more efficient working force than we now have. I hope that everyone in the trade will show his interest in the Association by becoming a member, and participating in its affairs, so that my successors may be encouraged to carry the Association on further, that when each in turn steps down from office it will be stronger and more useful.

In this connection I wish to dwell for a moment on one thing, and that is the necessity of having such an organization as this is. We are now in an era of organization of both capital and labor, and no industry can hope to attain the full measure of its influence without concerted action.

Any industry has, like any nation, its natural foes. The paper industry of this country is to-day subject to attack on many sides. Hostile interests are liable to seek legislation that will be detrimental to it; labor is likely to combine against it; the industry of other nations is pitted against it wherever it seeks new markets to maintain a growth which is so necessary to keep it in a vigorous condition. Hardly a day passes but brings with it something that could and should be done to promote the general interest of the paper industry of the United States. We can, perhaps, shut our eyes to opportunities, and thus escape temporarily a realization of loss, but the injury is no less, although not immediately apparent. We do not begin to realize the possibilities of concerted action. What might otherwise be considered visionary would be readily attainable. If the paper indsutry of the United States should arise in its might, so to speak, and determine to capture the markets of the world, there is no nation that could stand against us, with our natural resources for making paper and our national traits of character. Are not many of us too content to move in our accustomed, limited spheres, perhaps dreading the effort that is necessary to expand them. There is no doubt something in each line of papermaking to be learned by investigation of foreign methods, both of making and marketing goods, and it is perhaps not too much to say that each manufacturer owes it to his country and to the industry, no less than to himself, to investigate and appropriate the best methods of the world. In the hope that one who has made a long study of a much neglected side of paper making might give us some helpful knowledge, we have invited Mr. Little, one of the foremost chemists in his selected lines, to read a paper dealing with recent advances in paper making. This apathy may explain the attitude of many in the industry toward the Association. They appear to be too indifferent to arouse themselves to help what they do not or cannot see any immediate return for. The membership of this Association should be at least 1000. Such a membership would fairly represent all the paper and pulp interests of the country. Speaking in the name of such a membership, and with the organization that such a membership would permit, service could be rendered in return incomparably greater than the cost of membership, or the time and labor involved. Even now the influence of the Association is very considerable, as shown by the attention which it receives from the Government officials and all others with whom it carries on negotiations.

In no connection is the advantage of associated action more apparent than in relation to the enactment of advantageous laws. The desires of this industry, as expressed through the officers of this Association, have been consulted frequently by the officials of the United States Government, and to such an organization they naturally turn as the source from which to gain information to enable them intelligently and impartially to shape legislation affecting its interests. The Association is the principal avenue through which any legislator can get at representative statements. Likewise the advantage of concentrated effort is shown in gaining information so much needed at present as to the condition of the paper markets of the world. At the request of this Association the State Department through its whole consular service is gathering information which, when received and compiled, we hope will prove of great value to the manufacturers of all kinds of paper throughout this country.

There has been brought before this Association, as the members know, the question of compiling and getting together statistical information in regard to the paper trade of the United States, and I most respectfully urge upon the Association the great benefit of such knowledge in the hands of the manufacturers. I sincerely hope that some method may be devised by which such statistical information as will be beneficial to the whole manufacturing industry can be regularly compiled and distributed. Your officers have secured the presence here of the Honorable Carroll D. Wright, who has prepared a very interesting and able paper upon this subject, and who is now engaged in taking a census of the paper industry in some of its most essential aspects.

The principal paper manufacturing countries of the world have associations of paper makers, but the objects sought and the results obtained differ widely in different countries. An association of paper makers in France possibly accomplishes more for the manufacturer, jobber and consumer, in the way of practical good, than any other similar association in the world. The work of this Association is conducted somewhat along the lines of an exchange, or clearing house, and one of its features is the arbitration of all mercantile questions arising between the consumer, jobber and manufacturer. They have a complete organization, and to it are referred all questions in dispute regarding the quality of paper, of materials used in the paper, terms of contracts, conditions, etc., the organization acting in the capacity of referee, hearing all such questions, and the decision rendered by this body is usually accepted by the disputing parties as a basis of settlement.

The past year has been one of marvelous expansion in the export trade of this country. Our industry has shared in this increase of foreign trade, but not to the extent that we ought to. Our own markets being the best in the world, manufacturers in past years have naturally confined their efforts practically to them, but we have reached such proportions in our ability to manufacture all kinds of paper that it seems as though there was never a more opportune time to explore and make conquest of the foreign paper market. What plans to adopt to produce this result is for the Association to have a voice in determining. United efforts by leading manufacturers of paper, and the establishment of agencies in the different large foreign markets would have unquestionably a greater tendency to increase the aggregate amount of export business in all kinds of paper than could be achieved by any one single firm, or an equal number acting independently.

The amount of paper exported during the eleven months ending with November, 1897, was	$4,014,842
And for the eleven months ending with November, 1898	5,143,055
Showing an increase of	$1,128,223

Among the manufacturing industries of the United States we rank about seventh, but in our exports we rank about twelfth only. With energetic individual and united efforts we ought to raise our position among the exporting industries and we certainly ought to export largely in excess of the figure above given.

As an Association and individually we ought to encourage by every means in our power the upbuilding of the merchant marine. One of the most important factors in enabling us to increase and permanently maintain our foreign export trade is the establishment of steamship lines, running under the American flag, from our ports to the different countries where we seek permanent markets; therefore every members of the Association shuld do all in his power to bring about the permanent establishment of an American merchant marine.

There should be at once an active interest taken by the manufacturers of paper in the United States in making a creditable exhibit at the Paris Exposition in 1900, in order to show to the foreign world the varieties and excellence of the paper we manufacture. Mr. Ferdinand Peck, Commissioner General to the Paris Exposition, is anxious to do all he can to help the manufacturers of paper in this ambition, and Mr. Capehart, director of the Liberal Arts and Chemical Industries division of the Commission, will represent him at this meeting.

We hear a great deal about possible wars between the different nations, to demonstrate their physical strength, but the real war that is now on, and that has been on for twenty-five years, in full force, is the commercial warfare between the great nations of England, Germany, France and the United States. That struggle will continue, and the victorious nation will triumph by no accident or chance of battle, but by well matured plans and through the excellence of its equipments, tactics and plans.

Germany points with pride to the marvelous success that she has accomplished in so increasing her manufacturing that today she not only supplies her home markets but, in addition to that, the products of her mills can be found in almost every

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market of the world. The question is naturally asked: How has this great increase been brought about in so short a time? The answer is found when one investigates. The principles which have made her army have made her factories. Starting with the desire to create, there is no nation in the world that appreciated more fully the necessity of equipping her manufacturers with intelligent labor than the Germans, and they have carried this to such a degree of perfection by means of compulsory education, through the common and high schools and technical schools, that to-day they are turning out from their institutes of technology thousands of young men, and as the result of that compulosry education they are furnishing to the manufacturer a very much higher average degree of intelligence to meet his requirements in the various branches of his business than is received by the manufacturers of any other country. In order further to aid her manufacturer, merchant, and her commerce in general, the question of teaching languages in schools has received much attention, and to-day the average young German graduate can speak more languages than the graduates from the technical schools or colleges of any other nation.

In each of the large cities of the different provinces which go to make up the German Empire exposition grounds have been laid out, on which are erected large permanent buildings. At these expositions, which remain open for several months each year, will be found the best that the Empire can produce in Science, Art and the mechanical industries. The principal purpose of these expositions is to interest and educate the great masses of the people by object lessons, and they have worked marvels in improving and enlarging the different lines of manufacturing in Germany, until to-day she stands in the foremost ranks of manufacturing nations.

The English manufacturers and merchants in the past have shown themselves to be the peers of the world in their ability to manufacture and distribute goods, and this has been so to such an extent that they made the world pay them tribute. Years of this great success have brought about a certain degree of self-satisfaction and contentment, and this feeling has grown until they have in part forgotten the necessity for the well educated and equipped labor that the German manufacturers receive. In addition to this, the social status of the operative or mechanic, as compared with the clerk who enters the banking or government employ, or the railroad field, or other lines of business, has been such that it has withdrawn from the manufacturer the intelligence that is so essential to perpetuating success in any line of activity. England has neglected the old adage, that "Eternal vigilance is the price of success." However, to-day we find that such men as the Honorable Joseph Chamberlain have awakened to the great necessities in this direction, and they see that if England is to maintain her past greatness as a manufacturing nation she must at once rearrange her affairs and equip her manufacturers with that high class of intelligence that Germany is now furnishing to hers.

In the United States it is commonly stated that our inventive ingenuity and applied energy will overcome all obstacles, or offset any advantages that manufacturers in other countries engaged in similar business might have over us. Is this a fact, or is it true only to a limited degree? Certainly in our line it is not an unqualified fact, for it was not the United States that gave to the world one of the greatest benefits that mankind has ever received, namely, Cellulose, the cheapest and most bountiful raw material for the manufacture of paper. To Germany and Austria the world is indebted for the discovery and use of cellulose in the manufacture of paper.

Wherein the American manufacturer excels, in part, is in the general knowledge which he possesses, and in utilizing the creation of others in modified and more practical form. To these advantages he adds that untiring energy, close application and long hours of constant and earnest labor which are unknown to the managers of manufacturing plants in any other part of the world. He has, moreover, in abundance, great natural advantages over those engaged in similar business in any other country, both as to raw materials and in his home market for his products. To improve and utilize these advantages to their fullest extent, the questions of furnishing to the manufacturer the highest class of technically educated young men to form the army of operators of the future in his mills, of educating and preparing such an army, should receive careful thought. Whether these technical schools can best be created and governed by the nation, state or town is a question that agitation, discussion and experience will finally settle, but the establishment of such schools is an absolute necessity, as thorough technical education in operatives is becoming more and more a necessity each day. There should be an abundance of such educated labor produced annually, so that it may become within the means of all manufacturers to employ it to the fullest extent, thus putting the manufacturers of this country on a par in this respect with the other great manufacturing nations of the world, and to accomplish this end every man engaged in manufacturing should use his best endeavor. In this international commercial conflict it is no less a public duty for each manufacturer and each industrial association to enlist than it is for every man to respond to the call to arms when our national sovereignty is threatened. (Applause.)

On motion, the president's report was accepted and ordered placed on file.

ANNUAL REPOET OF THE SECRETARY.

Secretary Lyman then read his report, as follows:

Before chronicling the work of the association during the past year it is my duty to record the fact that we have lost by death several of our members, among them two of the ex-presidents of this association—Byron Weston, who died November 9 1898, and Wm. A. Russell, who died January 10, 1899. The others who have died during the year are as follows:

William Singerly.
Henry Gade.
James Fitzgerald.
S. A. Gibson.

The fact that has most impressed itself upon your secretary during the past year is the abundance of opportunities that present themselves for this association to serve the paper industry. In fact, the insufficiency of our organization and facilities have been time and again forced upon me. If your officers had more time they could have rendered greater service, and if we had had more permanent committees to have divided the labor the result would have been more gratifying. The need of permanent headquarters, where records can be kept and books of reference and statistical and other information collected and preserved, has been very apparent to us.

We have also been impressed with the absolute necessity of having a secretary, or assistant secretary, whose whole time could be devoted to the work of the association. Matters of moment have been slighted because of such a lack.

We feel, however, that, notwithstanding these limitations, the year has been one of practical results and of growth in influence and prestige, both of the association and, in a measure through it, of the paper industry. It has been very gratifying, in coming in contact with public men, to find in what regard our association is held, and how well known it is becoming. This result is no doubt largely due to the good work done by previous administrations.

As a matter of record, and in order that we may know and appreciate the many fields of usefulness which have disclosed themselves, I will refer to some of the matters which have especially engaged our attention.

An effort, instigated by some unknown interest, was made to have a duty of $8 a ton imposed on recovered sulphur, which is an English by-product. The association, together with other interested parties, immediately took the matter up, and, represented by ex-Governor Cheney and your secretary, a hearing was had before the appraiser of New York, and was followed up by a visit of your secretary to Washington, where he saw the Second Assistant Secretary of the Treasury, and received the announcement that the ruling which had been made was to be reserved. Had this ruling prevailed it would have prohibited the importation of thousands of tons of recovered sulphur, which would have had the effect of raising the price of crude sulphur, which is admitted free.

There was a similar contest over the case of tow flax, which is used by paper makers, but this case was prosecuted by private interests and no opportunity was afforded the association to assist. Had there been, we feel that material service could have been rendered.

Immediately upon the acquisition of Porto Rico and the assumption of military control in Cuba, the association, through its officers, made an investigation to see what effect the proposed changes in the tariff would have upon all grades of the paper industry. Personal interviews were had by the secretary with Robert Porter, the commissioner who visited Cuba and Porto Rico to study the tariff conditions, and whose duty it was, together with Assistant Secretary Rowell, to formulate a tariff for these countries. In these interviews the claims of the paper industry were presented, the paper industry being the first to take the matter up with the commissioners. The result was that we were assured that the paper industry would have every consideration; but the tariff, as finally arranged, while no doubt more favorable than would otherwise have been the case, does not fully meet our views, and steps are on foot to have it modified.

At the request of this association the Department of Labor in Wasrington, in the person of the Hon. Carroll D. Wright, most obligingly undertook to gather information regarding the output, capacity and stock of paper for the United States, the results of which will be forthcoming in a short time. The courtesy of the department in performing this servce for the paper trade should not go unnoticed. The success of this effort is already assured, and the results will be in advance of any heretofore achieved in the way of statistics of the paper industry. It occurs to me that some amends for an apparent lack of appreciation on the part of those who have failed to make returns might be made to the Commissioner of Labor, by a vote of thanks from this association, as representing the paper industry, for which the service was performed.

Other branches of the Government have most courteously assisted the association in gathering information of various sorts. The State Department, co-operating with the Bureau of Foreign Commerce, is now, through its consular service, undertaking a more thorough investigation of the paper industry of the world than it has ever undertaken on behalf of any other industry, and I believe more exhaustive than any industrial inquiry ever made by the consular service of any country. The results of this work will be given to the paper trade through the consular reports, and it is the secretary's hope that some provision may be made for collating, analyzing and tabulating not only this information, but much other information which has been obtained through other channels. This investigation has been set on foot with the idea of encouraging the exporting of American paper, and it is believed that if we know wherein our strength and weakness lie we can dominate the paper world. This is a matter that should not be left to any one branch of the business, much less to any one, two, or three companies, for if all work together we can more readily increase the prestige of the country, remove the obstacles in the way of building up foreign commerce, acquire a momentum which will carry us together where individual or sporadic effort would fail, and effect, by an increased volume of export, an increase in freight facilities and a decrease in freight rates.

One of the most potent agencies for extending American commerce is the Philadelphia Museums. The work that it is doing is of a very high order, and it has already rendered assistance to other exporters of paper. In order that our association might be in close touch with this organization, the request was made for representation upon its advisory board, which request was courteously acceded to, and our association is now represented by its president and secretary. In this connection I wish to call attention to the international exhibit under the auspices of the Philadelphia Museums which is to be given this year. It is to be an exhibition of all articles suitable for export and import. This exhibition is to be conducted on the most practical lines, and it will no doubt well repay our paper exporters to participate.

Among projects before the people which might well receive the support of this association is the establishment of a bureau of commerce and industry in Washington.

The most important work that the association has undertaken has been in connection with the effort to have the duty removed from paper and pulp. Active steps were immediately taken to resist the attack, and the satisfactory outcome is to be ascribed in a measure at least to the work performed by this association. Prominent manufacturers in the East and in the West were called upon to enlighten the Joint High Commission and Representatives in Congress as to the judiciousness of any such action, and to urge the claims of the paper industry to continued protection. The Honorable Warner Miller, an ex-president of this association ex-Governor Cheney and a delegation from the West rendered much service in this matter.

It has been the effort of the secretary to keep alive an interest in the association among its members, and to make the association of as much practical value as possible, and to this end arrangements have been made with prominent publishers, covering practically the whole field of literature, by which members of the association may secure a very unusual discount.

A calendar was prepared, which had the double object of being a reminder of the association and a repository of some information which might be of interest to the trade.

I am glad to be able to report that the membership is greater this year than at the time of my last report, for which fact I wish here to thank those who were instrumental in bringing it about—especially the committee on membership, of which Mr. Waller has been an efficient chairman. The membership to-day is the largest in the history of the association:

Total number last year		245
Resignations	8	
Deaths	6	
	—	14
		231
New members		44
		275
Net gain		30
Membership annual meeting, February, 1897		182
Total membership February 12, 1898		245
Total membership February 15, 1899		270

It is very gratifying to be able to report that several prominent Western manufacturers have joined during the year.

Of the resignations, it may be said that all of them were tendered for causes which in no way reflected upon the association.

I wish to express my thanks for courtesies received from the paper-trade press, and for their assistance in promoting in every way the power and influence of the association.

I take this opportunity to thank the members of the association and to acknowledge the obligation under which I feel to the president of this association for the guidance and encouragement he has afforded me in the performance of the duties of my office.

Respectfully submitted,

C. W. LYMAN,
Secretary.

TREASURER'S REPORT.

Treasurer Lyman then presented his report as follows:

I am glad to report that there are no dues in arrears for 1898, and but 17 dues for 1899 are unpaid. I may add, however, that this result has not been obtained without the exercise of considerable persistence, the total number of notices which it has been necessary to send out to secure the payment of about 250 dues for 1899 being in the neighborhood of 600.

RECEIPTS.

Balance in Treasury, February 17, 1898		$1,763.53
By initiation fees at $10:		
3 for 1898	$30.00	
33 for 1899	330.00	
		360.00
By dues at $5:		
52 for 1898	$260.00	
255 for 1899	1,275.00	
		1,535.00
Interest Washington Trust Co.:		
February 4, 1898	$8.31	
June 30, 1898	11.27	
December 7, 1898	12.51	
December 31, 1898	3.43	
		35.52
Received for pamphlets		6.43
Received for one dinner ticket		6.00
		3,706.48

DISBURSEMENTS.

Balance in Treasury February 17, 1898	$1,763.53	
Miscellaneous Disbursements connected with last meeting	873.56	$873.56
Actual amount available for 1898-99	$889.97	
Stationery and postage		191.92
Traveling and current expenses		158.17
Calendars		168.93
L. M. Bickford, one dinner ticket		6.00
Assessment National Board of Trade		35.00
		$1,433.58
Allowance of Secretary		400.00
Balance in Bank, February 8, 1899		1,872.90
		$3,706.48

STATEMENT OF MEMBERSHIP.
As Per Treasurer's Report, 1899.

Members reported at last annual meeting		245
Resigned, unpaid	7	
Deceased, unpaid	5	
		12
		233
New members during 1898-99		39
		272
Members who have not paid dues for 1899		17
(1899 dues paid as per Treasurer's report)		255
Members who have not paid initiation fees for 1899		5
Initiation fee paid in 1898 for 1899		1
		6
New members for 1899, 39, less 6, unpaid (1899 in fees as per Treasurer's report)		33

STATEMENT OF ACTUAL MEMBERSHIP.

Members reported last meeting		245
New members, 1899		39
		284
Resigned:		
Paid	1	
Unpaid	7—8	
Deceased:		
Paid	1	
Unpaid	5—6	
		14
Membership roll for 1899		270
Membership for 1898		245
Net gain		25

On motion the president was requested to appoint a committee of two to audit the treasurer's report.

The president appointed J. F. Ackerman and J. N. Mohr as such committee.

REPORT OF THE WRITING DIVISION.

The report of the Writing Division, by Vice-President William F. Whiting, was read by J. F. Ackerman:

Mr. President and Gentlemen: The condition of trade among the writing mills during 1898 was quite similar to that which prevailed in the previous year.

From 1886 to 1893 the manufacturer experienced a good business, and this stimulated the addition of product to many mills and the building of several new ones, so that when the panic of 1893 came the manufacturer had to contend not only with the prevailing financial and business depression, but also with a large over-production. For the past year trade has been fair, and may be said to be improving, and yet the volume is not sufficient to make a brisk demand. Undoubtedly during the last three years there has been a gradual improvement in favorable conditions. Confidence has been restored in the financial affairs of the country, but the paper manufacturers have realized that in order to dispose of their enlarged product a broader market must be found. These conditions are now operating in favor of the manufacturers, and the result is that there is a more hopeful feeling.

The Holyoke, and, I think, all of the

E. P. LINDSAY,
Selling Agent,
No. 169 Congress Street,
BOSTON, MASS.

Odell Manufacturing Co.,
HIGH GRADE MANILLA PAPER AND SULPHITE PULP.

TREASURER'S OFFICE
and
MILLS,
GROVETON, N. H.

DAILY PRODUCT: TWO HUNDRED AND TWENTY-FIVE TONS, AIR DRY WEIGHT.

BURGESS SULPHITE FIBRE COMPANY, - BERLIN, N. H.

J. L. & D. S. RIKER, 46 CEDAR STREET, NEW YORK. Importers and Manufacturers' Agents.
ALL TESTS SODA ASH AND ALKALI.
Sole Agents for the United States and Canada of THE UNITED ALKALI CO., Ltd., of Great Britain.
FOR THE SALE OF THEIR VARIOUS BRANDS OF BLEACHING POWDER.

Katahdin Pulp and Paper Company, LINCOLN, ME., Manufacturers of Sulphite Fibre.
WE MAKE A SPECIALTY OF THE HIGHEST GRADE SULPHITE for Book, Ledger, Writing and Manilla Papers.

manufacturers, have shown a conservative spirit, inasmuch as they have only run their mills when they had orders. If the mills continue the same course there will be no surplus of paper to force upon an unwilling buyer.

There have been no new mills built during 1898, neither has there been any large increase so far as I know in production among the mills now running. Taking into consideration the more favorable commercial conditions of our own country, and the increased reputation abroad of our manufactured articles, together with the disposition manifested by the manufacturers not to increase product, and not to crowd on the market what is not wanted by the trade, we may, I think, confidently hope for a better demand and an improvement in prices.

The report was accepted and ordered placed on file.

REPORT OF THE BOOK DIVISION.

The report of the Book Division was then read by Vice-President James N. Mohr:

Mr. President and Gentlemen: While the business interests of the country have shown a marked improvement over 1897, our fondest hopes for a general revival in business have not been realized. Our late war with Spain, sprung on us so unexpectedly, but now an important fact in history, was primarily the cause of paralyzing the slight improvement in the early part of the past year, but the closing months of the year have shown a marked change for the better, and the demand for what is known as "Wood" supers has largely increased, but the prices, if quoted correctly, of many of these sales are truly staggering; but, as supply and demand always regulate prices, the above conditions will be changed; better times mean better prices and better goods. With our home consumption increasing it is also most gratifying to see the demand for our papers in foreign markets. To-day we have inquiries for our book papers not only from every country in Europe, but from the Far Eastern countries—India, China and Japan.

Therefore, with our usual optimistic view we see greater prosperity for this country than ever before, a state of affairs which the Book Paper Division will welcome as a "God-send."

The report was accepted and ordered placed on file.

REPORT OF THE NEWS DIVISION.

The report of the News Division was presented by Vice-President George C. Sherman, as follows:

Mr. President and Gentlemen of the Association: In presenting report of the News Division for the past year I take pleasure in referring to the encouraging signs which were apparent and discussed upon the occasion of our last annual meeting. The prospects of a year ago have to some extent been realized. About the 1st of September, 1897, we commenced to experience a somewhat better demand for paper, and from that time forward up to the talk of war a steady and uniform growth was noticeable. The recent war with Spain caused, of course, an extraordinary local demand for paper, but it appears to me that a careful consideration of the actual extra amount consumed would demonstrate that it is generally overestimated. Of course, the demand was immense at the time, but newspapers and mills wer all carrying small stocks. Consumers at once ordered wildly and far in excess of their printing possibilities. This state of affairs continued for some little time, even while the consumption was falling off, and when the dull season finally occurred and hostilities ceased, publishers found themselves with very large stocks and merely a nominal consumption. If, therefore, we could fairly average the effect of the war upon the amount of business we would otherwise have received for the year, it seems to me that the extra quantity consumed will be found to be less than generally supposed.

I have referred to the results for the year as being more satisfactory generally to news paper manufacturers than the results of previous years, and while this is so, it is, nevertheless, a fact that prices are not yet as high as they ought to be, to pay interest upon investment, wear and tear upon machinery and to provide for the contingencies, which I might better call certainties, in the way of accidents to machinery, floods, etc., connected with our business.

In such a report as this it seems proper to call attention to the unjust but vigorous demand which the Newspaper Association is now making for the free admission of pulp and paper from Canada. Their own briefs logically and conclusively prove the injustice of their demand. In calling attention to it I desire to state that the officers of the association have taken notice of the situation and have endeavored to do their duty in the matter.

Before closing I would like briefly to call attention to a subject which was ably discussed before us at our last meeting by Messrs. Pinchot and Fernow, viz., the question of spruce supply in the future. It has been discussed by press and people in the State of New York for many years, and perhaps no other received more attention or was more influential in gaining votes for it than this portion of the new constitution of the State of New York. Even as I write this report I notice that the Governor of this State was but yesterday in conference with the New York City Board of Trade and Mr. Pinchot upon the subject of passing a law for the protection of the forests of our own State along the same lines as the laws in Germany. It appears to me that we all must soon pay higher prices for our spruce, for if such a law is passed spruce pulp or the price of spruce pulp, in the State of New York, at least, will be governed by the cost of its cultivation. That such a law will be passed eventually seems certain. It is a proper subject of State control because the preservation of our water powers, with their millions of dollars of invested capital, is in the balance.

With somewhat enhanced cost of materials for making paper within the Eastern States, because the course adopted by this State will undoubtedly be followed sooner or later by the other States of the East, were paper and pulp admitted free from Canada, meaning thereby a selling price below the present, already low enough to make the publication of newspapers much more profitable than the manufacture of paper, what might be the outcome but the closing up of all our mills and the transfer of this great industry to a foreign land? Gentlemen, I believe that the newspaper owners are unreasonable and wrong, and that the gifted men representing the interests of the United States upon the Joint High Commission will so determine.

The report was accepted and ordered placed on file.

REPORT OF WRAPPING DIVISION.

The report of the Wrapping Division was read by Vice-President Samuel P. Train:

Mr. President and Gentlemen: While the outlook at the present time is not at all promising, I have the honor to report that the general condition of trade during the year past has been as a whole more satisfactory, and prices have averaged somewhat better than in 1897.

During the early months of the year the demand materially increased, and an effort was made successfully to advance prices. On account of the extraordinary demand for news paper during wartime, many machines well adapted for making news as well as manilla, which had been making the latter grade of paper prior to the declaration of war, made news paper, this fact no doubt being the principal factor for improvement in demand for manilla paper. Since the close of the war the production of manilla has greatly increased, and as a natural consequence eager demand for orders has gradually, through competition, reduced prices until at this time they are almost as low as at any time previous. What the future has in store is difficult to define, but certainly the outlook is neither promising nor bright. Unless some action is taken to improve the conditions surrounding us, to my mind we shall be wasting valuable time, money and machinery in vain efforts to realize what we strive for, and to which we are entitled—proper return for valuable investments made; and such return at the present time and under present conditions and outlook is impossible.

Let us hope that the time is not far distant when some action, concerted or otherwise, may arise whereby we shall derive proper compensation for good money invested in costly plants that now are being run without satisfaction and little or no revenue coming in.

The demand for all classes of manilla paper is large, the only drawback being prices, which, let us hope, may later on improve and put the mills on a proper paying basis.

The report was accepted and ordered placed on file.

REPORT OF WOOD PULP DIVISION.

The report of the Wood Pulp Division was presented by Vice-President K. B. Fullerton, as follows:

Mr. President and Gentlemen: As vice-president of the Wood Pulp Division I have very little to report. During the last few years the manufacture of ground-wood pulp as an industry separate from that of the manufacture of paper has declined steadily, until at the present time it amounts to almost nothing. There was a time when the manufacturers of ground-wood pulp were a class by themselves, but at the present time practically all the consumers of ground-wood pulp are making the material themselves, and the number of mills now making ground-wood pulp for sale is very small, and the product is insignificant in comparison with the quantity of pulp manufactured by those consuming their own product.

In consequence, the conditions of trade, high or low water, have affected to only a small extent the market for this article. Prices for it have changed but little during the year just past. The supply of water throughout the country has been very fair during the summer season, and pulp has not changed in value to any extent during the last twelve months. A little flurry in the market occurred at the end of summer, not because of actual low water, but caused by the fear of low water. This fear was, however, ungrounded, and the flurry did not last more than a week or ten days. The condition of the market to-day is about the same as it was a year ago. There has been no increase in the amount of wood pulp made for sale during the past twelve months, and the demand for the product that is for sale has remained about the same.

The report was accepted and ordered placed on file.

REPORT OF CHEMICAL FIBRE DIVISION.

The report of the Chemical Fibre Division was read by Vice-President A. G. Paine, Jr.:

Mr. President and Gentlemen: With but few changes the statements made in my report for 1897 will apply equally to the report for 1898.

Soda Fibre.—The soda fibre industry has been for the past year, and is still, unremunerative. The slight advance in the selling price last spring has been maintained; but this advance is not sufficient to put the mills on a paying basis. During the last year there does not seem to have been an overproduction of soda fibre, the demand having met the supply. I can safely predict the output for the market for 1899 will be 18,000 tons less than in 1898. This will be due to the stoppage in the near future of a mill in Maryland, and to an increased consumption of pulp on the part of manufacturers who operate paper mills in connection with their fibre mills. It is, therefore, evident that an advance in the selling price in the near future is to be expected.

Sulphite Fibre.—During the year 1898 no new mills have been completed, although several are in course of erection. A number of old mills have increased their output, making the total production at the present time 1,339 tons for every twenty-four hours. During the early part of the war the increased demand for news paper made sulphite very brisk. This was further augmented by a temporary stoppage of sulphur shipments from Sicily. Prices advanced considerably; in some instances sales were made at 2½ cents per pound, delivered. During the last part of the war, however, the demand declined and some firms accumulated pulp, which they sold at a sacrifice. Mills making a better grade of pulp have maintained prices, so that the business for 1898 has been fairly profitable.

It is not out of place to point to Canada as a growing competitor. A number of large sulphite mills are projected, some of which are now in the course of construction, and their product will shortly be placed on the market. While the operators are building these mills with a view to exporting to Europe, they are relying on placing a portion of their product in this country, and this they will be able to do, even under the present tariff, shipping to points in the United States where reasonable freight rates can be secured. They have a decided advantage over American manufacturers in cost of labor and pulp wood. The latter can be delivered to their mills as low as $2.50 per cord in some localities. Thus it is quite evident that in the course of time Canada will prove a formidable competitor of our mills.

Imports.—The imports of pulp from Europe, consisting of high grades of bleached sulphite and sulphate and unbleached soda spruce, during the year 1898 amounted to about 4,236 tons, an increase of 756 tons over 1897. I have been unable to get any but approximate figures of the imports of sulphite fibre from British North America. As near as I can estimate, however, the amount has not exceeded 1,200 tons.

The report was accepted and ordered placed on file.

REPORT OF THE BOARD DIVISION.

The report of the Board Division was presented by Vice-President Charles D. Brown, as follows:

Mr. President and Gentlemen: The manufacture of straw, wood pulp, news, and kindred boards had, in 1898, a better business than in any of the past five years. While the profits have not been large, they have given most of the mills a fair gain.

Owing to unfortunate and ill-advised competition, the mills making straw boards have not been able to sustain uniform prices; this has not given satisfaction, even to consumers, as a whole, as they prefer uniform prices to the repeated changes made during the past year.

While accurate figures cannot be obtained as to the number of tons manufactured, the number of tons sold, or the full capacity of the mills making straw boards, we have from parties directly connected with the two straw board associations the following approximate figures:

	Tons per day.	Tons per year.
Straw board manufactured in 1898.....	480	144,000
Straw board sold in 1898.	450	135,000
Full capacity of the present straw board mills..	725	217,500

It is reported that some of the larger manufacturers are formulating plans for an association, the object of which shall be to sustain prices and encourage foreign trade. Quite a part of their product has been sent abroad; this trade has begun to be quite successful, and will doubtless grow to such proportions as to effectually relieve the domestic market of surplus straw boards.

The pulp, news and competitive manufacturers have had, for a few years, an association comprising most of the mills making these boards. In this way prices have been better sustained than during the years prior to the formation of the National Pulp Board Company. It is possible this association has outlived its usefulness, and there has been a disposition to cut prices. It is hoped, however, that the wood pulp and news board mills are to form a closer union, and steps are now being taken with that end in view.

The export trade in pulp and news boards is proving quite a factor in the market. From a small beginning a little more than two years ago, it has grown to large proportions, so that to-day, nearly, if not quite, one-quarter of the product of news board goes abroad.

The amount of wood pulp, news and kindred boards made in the country is about 108,000 tons per year, or 360 tons per day, the mills running 300 days in the year. Their full capacity is about 140,000 tons per year, or 460 tons per day, 300 days in the year.

This gives a total production (including all grades mentioned above) of about 840 tons per day, and the total consumption during 1898 was about 240,000 tons, or 800 tons per day. This is a much larger amount than any former estimate, but is very nearly correct.

The great demand for wood pulp for manufacturing almost all grades of paper and the increased uses to which straw is being put, tends to increase the cost of manufacture, so that it is hardly probable that prices will be very much reduced.

The report was accepted and ordered placed on file.

REPORT OF DELEGATES.

The report of the delegates to the National Board of Trade was made by W. H. Sharp, as follows:

Owing to the resignation of Mr. W. T. Barker and the illness of Mr. W. H. Sharp, the American Pulp and Paper Association was not represented at the twenty-ninth annual meeting of the National Board of Trade, held in Washington, December 13, 14 and 15.

Many important subjects were considered, and among the resolutions passed were the following, which will prove of interest to the American Paper and Pulp Association: Resolved, That as the quality and utility of American products are recognized wherever known, the United States Government should favor all reasonable measures to develop foreign markets and foster our export trade, and that reciprocal treaties should be negotiated with the countries of the American continent.

Resolved, That the National Board of Trade reaffirms its declarations of the importance and necessity of the preservation of our forests, and respectfully urges upon Congress and the Legislatures of the various States the enactment of such laws as will provide for the protection of our forests from needless destruction, and for the planting and care of new forests.

Resolved, That the National Board of Trade reiterates its action on former occasions, and respectfully urges upon Congress the grave importance of enacting a national trade-mark registration law at the earliest moment possible.

Resolved, That the National Board of Trade reiterates its repeated expressions for the necessity of reform in our monetary system.

We favor legislation:

First, That will permanently establish the gold standard.

Second, That will retire all kinds of paper currency issued by the Government as rapidly as can be done without undue contraction or injury to the agricultural, industrial or commercial interests of the country.

Third. That will provide for currency issued by banks, in safe proportion to their sound capital and surplus, as the needs of the country require, under such governmental supervision and control as will insure its redemption in gold on demand at bank of issue and at the leading monetary centres of the United States.

Resolved, That the National Board of Trade respectfully urges upon Congress immediate and definite action to secure the construction and control by the United States Government of the Nicaragua Canal.

Resolved, That as a step toward justice in transportation rates, greater uniformity in the classification of freight is necessary, and should the railroad companies fail to formulate and put into effect a uniform classification of freight within a reasonable time, that the Interstate Commerce Commission should be empowered to formulate and make effective such a classification.

Resolved, That the National Board of Trade reaffirms its former advocacy of the passage by Congress of the bill introduced by the Hon. Eugene F. Loud, chairman of the House committee on post offices and post roads, or a similar bill amending the postal laws relative to second-class mail matter, believing that such a measure will to a great extent correct the abuses prevailing under the present law, and tend to place the Post Office Department on a self-supporting basis.

Other resolutions were passed favoring

(1) The establishment of a Court of Arbitration between the United States and Great Britain.

(2) The extension of the American merchant marine and carrying trade.

(3) Absolute publicity to all railroad rates, rules or regulations affecting the transportation of property or persons.

(4) The right of railroads to make agreements for the maintenance of fair and uniform rates by and with the control of the Interstate Commerce Commission.

(5) The infliction of severe money penalties upon corporations or persons violating the rules and findings of this Commission.

Owing to the circumstances which prevented a full report being made by the Committee on Statistics, Mr. Mohr, chairman of the committee, made a verbal report, which was received and the committee discharged.

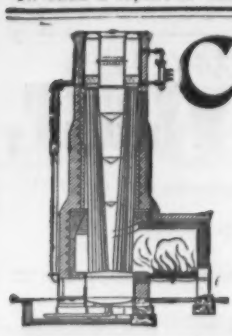
REPORT OF THE COMMITTEE ON THE PARIS EXPOSITION.

The report of the committee on the Paris Exposition, prepared by Chairman Col. Haskell, was read in his absence by A. J. Ackerman.

The report was accepted and the committee discharged.

Mr. Parsons—In connection with this report I would like to state that there is to be an exhibition in Glasgow the year

(Continued on page 126.)



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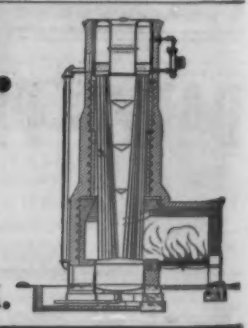

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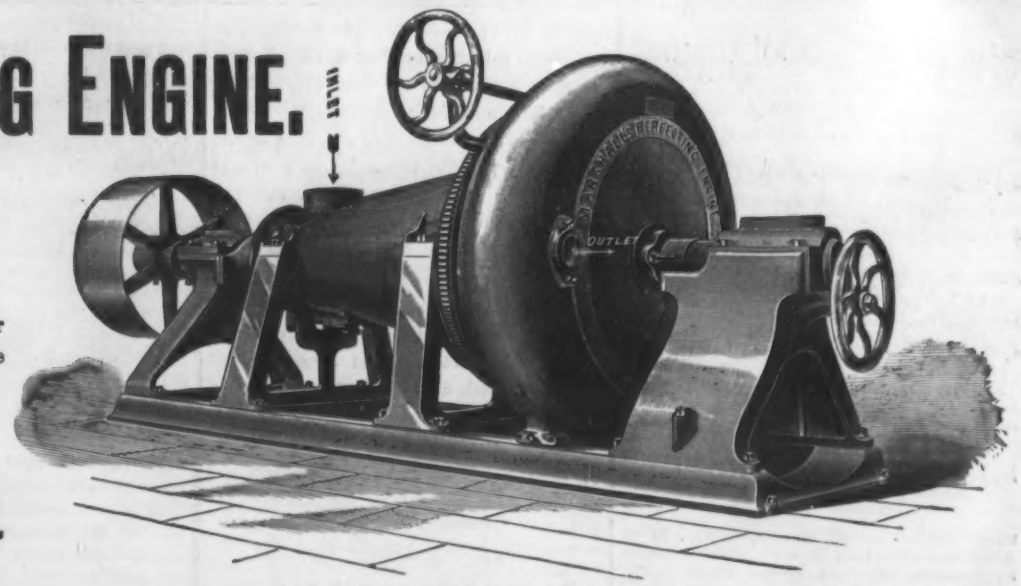

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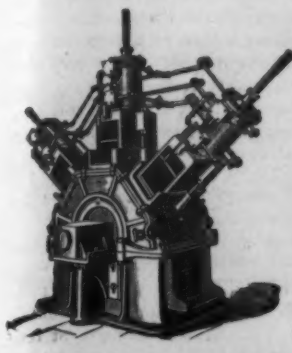

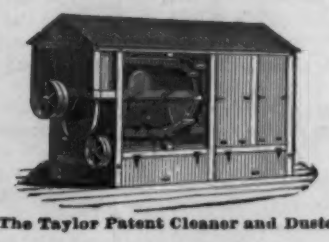

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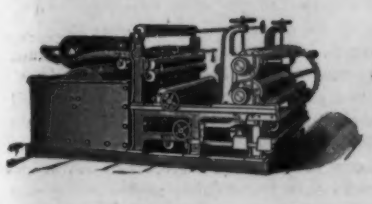

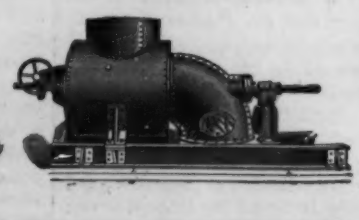

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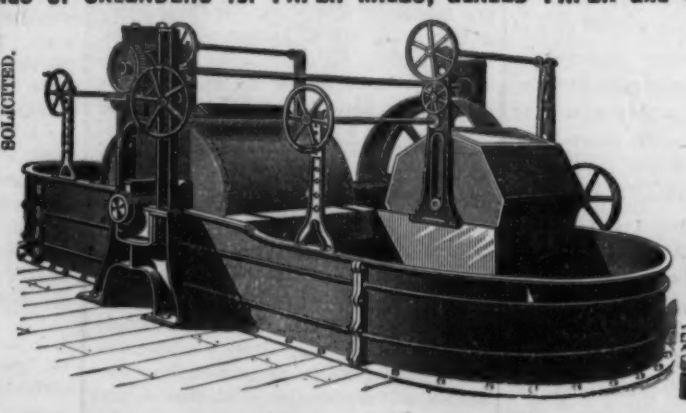

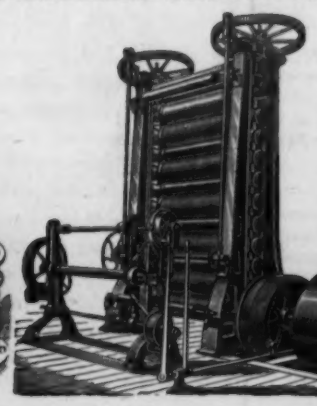

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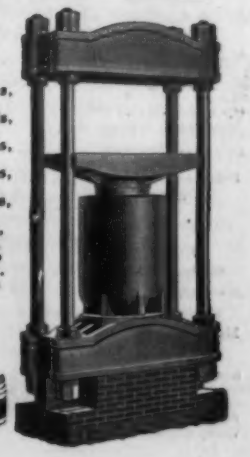

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THE PAPER TRADE JOURNAL will be found on sale regularly at the cigar stand of R. Harker, American Tract Society Building, 150 Nassau street, New York; at the Astor House newsstand, and at the news stand of Henry Tietjen, at the foot of the north stairs leading to the uptown Park row station of the elevated road.

NEW YORK, SATURDAY, FEBRUARY 18, 1899.

THE papers read at the annual meeting contain a good deal of valuable data pertaining to mill water supply. Several of these papers are of great value to the mill owner, and benefit may be derived from acting upon the matters there presented.

EVOLUTION in the construction of digester shells is in order. A few years since shells were not made very tight, and test holes were left at frequent intervals all over the surface. Shells are now specified to be caulked to stand about 150 pounds pressure per square inch. Immediate future improvements in engineering methods of designing digester shells will require that they be welded throughout, and only made in bolted together welded sections, as may be necessary for railroad transportation.

ALTHOUGH the attendance at the first day's meeting of the Paper Men's Meeting was deplorably small, the result must be attributed entirely to the unfortunate weather and not to any fault of the officers of the association, who should be sincerely congratulated upon the admirable arrangements which were made for the comfort and convenience of those attending the meeting. To those who have been in the habit of attending these annual meetings it is a constant subject of gratification to observe the increasing influence of the association, and we look forward to the time when the association will be the same power in the paper trade as are the associations of the Hardware Dealers' Association and the American Society of Mechanical Engineers in their own particular lines. In this connection may be noted the project of headquarters for the "Paper Men's Association." This matter should be at once placed in the hands of a good committee and the funds secured for maintaining headquarters as soon as possible. Among the available methods are those of voluntary subscriptions of a stated sum, say $100, which has to some extent been tried, but not fully canvassed. Other methods are by increasing the dues of the members or by the formation of a sort of stock company among the members. The first method would probably not be well received. The second method would allow each member to sustain such part of the expense as he felt able to bear, and does not limit either a small manufacturer or a large concern to a stated sum. By all means establish a permanent headquarters for the American Paper and Pulp Association in a home of its own, and the immediate result will be additional strength and progress.

TO PARIS AND GLASGOW?

The report of the committee on the Paris Exposition would seem to show that there is little or no chance of the American paper trade being suitably represented at the forthcoming exposition. It appears that the entire space allotted to the paper trade is 1,000 square feet, from which we can only infer that the authorities in charge of the distribution of space have but a small idea of the methods and machinery employed by American paper manufacturers in their industry. Of all countries that should be adequately represented in the paper trade, the United States stands first, holding as it does the foremost position in the world in this trade. It is suggested, and we consider very rightly so, that Government aid should be solicited in obtaining a grant of money sufficient to cover the expense of obtaining suitable quarters for the exhibiting and operating of all kinds of machinery used in the art of paper making in this country. This is a suggestion that we shall hope to see acted upon and with success. The amount would be but small, according to the estimate given by the committee, who suggest that a certain portion of the press building should be taken over by the association for its requirement, and conducted under its auspices.

Attention was drawn by Mr. W. H. Parsons to the fact that Glasgow has an exhibition which follows closely on that of the Paris Exposition, and it should prove an easy matter and one worthy of the consideration of our manufacturers to transfer their exhibits on the close of the Paris Exposition to Glasgow, and thus obtain the benefit of an additional exhibit at a reasonable cost.

It will surely be a matter of the greatest regret should the American paper trade not be fully represented at the Paris Exposition.

Watermarks.

BY DANDY.

Coming down town on the new electric car line the other day, one of New York's well-known paper men took a seat in a Madison avenue car, and a small boy took a seat beside him at the same time.

"Fare, please," said the conductor, "and 5 cents for the boy." "I never paid fare for the boy." "Well, you must, he's too big to ride free." "But I never paid for him before, and I won't begin now!"

"You must pay the boy's fare, or I'll stop the car and put you off!" "Just go ahead, and see how quick the company will have a big damage suit on their hands."

At this point a policeman entered the car, and the conductor explained matters to him. The "cop" approached the paper trade man, and asked him why he did not pay the boy's fare, and thus avoid a disturbance?"

"Why should I pay for him," said the P. T. man, "I never paid before." "Well, he's your boy, you know, so you've got to pay some time." No! I don't know. He's no more my boy than he's yours!" "Isn't he with you?" "No. Never saw him before in my life!"

A large-sized smile went around at the conductor's expense; but it doesn't do to ask the P. T. man how his electric car son is unless you wish to hear that poor conductor abused.

All sorts of things are suggested by all sorts of people, but the queerest idea yet is advanced by a Nashua (N. H.) man, who seriously writes to the daily press of that city to the effect that the United States Government "absorb" the I. P. Company, root and branch. He writes:

"Let the United States Government purchase the International Paper Company's plant, run it economically and furnish paper to the newspapers and the people at cost of production and distribution."

That's rich! Just imagine the Government trying to run the I. P. C. at all, much less to run it economically!

What a fine thing it would be for the newspapers to get paper at cost, wouldn't it? And how the people would get the benefit of the low prices of paper. How they would give away their yellow blanket sheets and use war heads for every day, if the Government would give paper at cost!

But Dandy is afraid that the price of Government-made news would be even greater than is now charged by the I. P. C. The fact is, the newspapers occupy much the position that the devil does in the following verse to wit:

"When the devil was sick
The devil a saint would be;
When the devil got well,
The devil a saint was he."

Failure.

The Atlanta Paper Company, T. S. Lewis, the Atlanta (Ga.) Trust and Banking Company, S. E. Walker, John Silvey & Co., and Hunt & Golightly, creditors, filed a petition for involuntary bankruptcy against J. L. Walker & Co. in the clerk's office of the United States Court on February 4. The firm, which is composed of J. L. Walker, residing in Waco, Tex., and Mary Walker, of Decatur, owes indebtedness aggregating about $1,000.

Accidents.

Thomas Brady, machine tender at the Beckett Paper Company's (Hamilton, Ohio) establishment, where he has been employed for fifteen years, had his hand caught in the cadenders, and three fingers badly crushed, probably necessitating armputation.

Frank Wigand, employed in the Hamilton (Ohio) foundry of the Black & Clawson Company, accidentally spilled a quantity of molten iron on his left foot, burning the member severely.

A Celebrated Case Closed.

An entry was approved in the courts of Butler County, Ohio, February 14, closing a celebrated case. When William Beckett died and his estate was settled up it was found that 390 shares of the Beckett Paper Company were in the name of Mr. Beckett. The claim was made that the stock had never been paid for, and hence could not be considered as the property of Mr. Beckett, and, moreover, could not be regarded as an asset in the hands of the administrator.

The case was tried by Judge Neilan, who held that the stock was legally an asset of Mr. Beckett's. The case was appealed to the Circuit Court, and that body made a technical decision. It then came back to the administrator.

Judge Murphy appointed an appraisement committee, and the appraisers returned a valuation of $1,500. The court approved an entry selling the stock to Thomas Beckett for $1,500, thus disposing of the matter.

Personal.

L. G. Barker, of the Edison General Electric Company, Schenectady, N. Y., was at the annual meeting as a guest of F. S. Van Vleck, of the Manhattan Rubber Manufacturing Company.

Frank Tytus, of the Tytus-Gardner Paper Company, Middletown, Ohio, is now the chief engineer of the plants under the supervision of this concern.

The Frederick Post Company, Chicago, Ill., desires to ascertain the address of E. Tracy, a machine tender, probably engaged in some Eastern mill.

Our Dayton (Ohio) correspondent pays honorable tribute when he writes that Dayton was recently honored by the presence of John H. Patterson, a humanitarian and an advanced thinker, who is busily engaged just now, it appears, from his active campaign in the interest of employers and the employed, in a tour of instruction and education. Mr. Patterson has achieved an international reputation as a just and honorable employer, and his factory methods, which have been in vogue in the cash register works for several years past, it is predicted, will be extensively adopted in large mill centres all over the world. Recently at his own expense Mr. Patterson escorted the delegates of the National Manufacturers' Association to his immense Dayton plant, where he tendered them a banquet after an inspection of the plant. As fully noted in these columns at the time the methods of the factory were vividly and strikingly illustrated by means of beautifully colored stereopticon views. The gathering, representing the sinew of all the manufacturing interests of the greatest nation on the globe, was momentous, and its action in heartily indorsing Mr. Patterson's plan was nationally significant. Whether or not Mr. Patterson spoke of reforms before the American Paper and Pulp Association, it is known that his talk was pointedly profitable.

Superintendent Porter Farwell has been appointed manager of the Turner's Falls (Mass.) mill of the International Paper Company.

Fires.

Fire, supposed to be due to spontaneous combustion, occurred in the waste mill operated and owned by John Cunningham, at Emerald and Huntingdon streets, Philadelphia, Pa., on February 5. Loss, $8,000.

The great book house of A. C. McClurg & Co., Chicago, Ill., at the corner of Madison street and Wabash avenue, lies in ruins. It was destroyed on February 12 by fire, which was first discovered about ten o'clock in the forenoon, and is thought to have been caused by a gas explosion, brought about by the intense cold of the week. In a literary point of view this is the saddest fire which has visited Chicago since the great conflagration of October 9, 1871. It wipes out of existence the largest book and stationery house in the West, if not in the country. Many quaint volumes were destroyed which cannot be replaced. The building belonged to the Rutter estate, and was insured for $100,000. It was built in 1873 at a cost of $140,000. A new building will be erected on the site immediately.

Obituary.

Gardner Howland, a retired paper maker, Sandy Hill, N. Y., is dead at the age of eighty-two years. He was closely connected with the early history of the papermaking industry in that village, having been interested in the building of the first paper mill there. He afterwards built a paper mill at Troy, one at Fort Edward, another in Canada, one in Stillwater, and also another near Rochester. He then went out of the paper making business, and removed to California, where he purchased a ranch and engaged in raising fruit. After all these years of business activity he retired to the city of Los Angeles, and made that place his home until his death. Mr. Howland was one of the members of the famous Troy Praying Band, and was interested actively in founding the camp meeting grounds from which grew the extensive interests of Round Lake. He was a hearty and generous man, whose means were freely given to the aid of religious objects. One of Mr. Howland's sons was for a long time proprietor of the Arlington Hotel at Ocean Grove, N. J., and another conducted the Lick House in San Francisco. He is survived by a widow and five sons.

Incorporated for $25,000,000.

The General Chemical Company, with a capital of $25,000,000, was incorporated at Albany on February 15th. The principal office is to be at Phillipstown, N. Y. The directors are William H. Nichols, Sanford F. Steele, George W. Kenyon, Charles Robinson Smith, James L. Morgan, Jr., Louis S. Wolf and J. Herbert Bagg, of New York city; Eugene Waugh, of Highland Station, Putnam County; Frederick Phillips, of Philadelphia; C. P. Tiers, of Pittsburg; E. H. Rising, of Cleveland, and H. F. Chappell and H. W. Chappell, of Chicago.

W. H. Nichols, of Brooklyn, it is said, will be the president; James L. Morgan, Jr., its treasurer, and E. H. Nichols, its secretaary. Among the companies which it is reported will be in the combination are the Nichols Chemical Company, M. Kalbfleisch Chemical Company, James L. Morgan & Co., Dundee Chemical Company, Lodi Chemical Company, Passaic Chemical Company, Highlands Chemical Company, Fairfield Chemical Company, Moro Phillips Chemical Company, Philadelphia Chemical Company and National Chemical Company, of Cleveland. Only one large chemical house in the East is reported to have declined to join in the consolidation.

It is stated that an informal agreement as to prices was reached several weeks since in order to put a stop to rate cutting, and the combination was an outgrowth of the agreement in question. One-half the stock is 6 per cent. cumulative preferred, the rest, common.

AMERICAN PAPER AND PULP ASSOCIATION.

(Continued from page 124.)

succeeding the Paris Exposition. There are now four gentlemen in this country, representative citizens of Glasgow, whose desire it is to enlist the sympathies of the American manufacturers, so that the exhibits, if any, that are made in Paris may be transferred to Glasgow, and I thought it might be of interest to ask if anything will be done in regard to the suggestions that have been made by this committee..

The President—We have now reached the point of miscellaneous business, and the secretary will read some letters.

(The secretary read a letter from Mr. Clark Cornwall, and it was agreed, on motion of Mr. Parsons, that a committee of five be appointed by the chair, and that the entire matter referred to in the letter be referred to such committee.)

Colonel Paine—We have had some conversation in regard to having another committee added to the list of committees, and that is a committee on legislation. Is it not a proper time to act upon that question, if it is thought well by the association to have such a committee? It is a very important thing, and there are many important questions arising now and going to arise in the near future, and it seems to me that a special committee to attend to that part of the work is highly desirable, and I move that a committee on legislation be appointed by the chair.

A committee was later appointed by the chair.

Colonel Paine—There is one other matter, and that is the appointment of a committee on prizes. It was thought best to stimulate industry by giving some prizes—say, a prize for the most important invention to be made during the next year relating to our industry, the most important invention in our industry, and also, perhaps, a prize for the best essay to be read at our next annual meeting. That would seem to be a matter of great interest, and perhaps promote the interests of our members in this association, and I make that motion, that the chair appoint a committee on prizes for those two purposes for the coming year.

There was no discussion, and the motion was put and carried.

The President—There are two other committees, the Paris Exposition committee and the committee on resolutions, and also the committee on nominations. It has been the custom to make a motion for the appointment of a committee on nominations to bring that properly before the meeting.

It was voted to follow the usual course, and that the chair appoint the committee on nomination, the committee for the Paris Exposition, statistics, and the committee on resolutions and amendments.

The President—The secretary very properly calls my attention to the fact that this is the 100th anniversary of the invention by Robert of the paper machine, which antedated Fourdrinier, and we will have a very interesting paper read in regard to that.

Mr. Colin K. Urquhart read a paper entitled, "Robert, the Father of Modern Paper Making," which will be found in full in another column.

Mr. Ackerman—It seems to me that one deduction to be derived from that article is that paper making 100 years ago was no more profitable than it is now, and the necessary thing for paper makers to do is to fit themselves to become school teachers.

The President—With your permission, gentlemen, I will now appoint the various committees. I wish to state, however, that we are to have this afternoon some very interesting papers, and I sincerely hope the members of the association will show their appreciation of the efforts that have been put forth by their officers, and also the kindness of the various gentlemen who have prepared the different papers to be read, by a full attendance. The papers have been prepared with a great deal of care, and an appreciation, at least by attendance, is expected of the members of the association, and, therefore, if each gentleman present will make himself a committee to bring one or two members here, we shall have a fair attendance. I would say, in connection with that, that tickets have been reserved by request for 150 members for the banquet. I suppose the storm has delayed a good many of them. But still I find they are getting around to the city. There may be a good many delinquent members in this house, or adjoining houses, and I hope you will make it a business to see that they come here.

The president then appointed the following committees:

Legislation (standing)—Incoming president, chairman ex-officio; incoming secretary, H. J. Chisholm, A. C. Hastings, C.

W. Lyman, Warner Miller, T. E. Nash, A. G. Paine, W. H. Parsons, F. C. Shattuck.

Prizes (standing), for best invention and best essay—G. W. Wheelwright, chairman; W. T. Barker, A. N. Burbank, H. J. Chisholm, T. S. Coolidge, Thomas Duncan, Geo. S. Knowlton, C. W. Lyman, J. N. Mohr, F. H. Parks, W. H. Parsons, Jr., Geo. F. Perkins, W. A. Russell, W. E. Spier, Wm. Whiting.

Paris Exposition (standing)—Warner Miller, chairman, news; J. Fred. Ackerman, news; Hugh J. Chisholm, news; W. M. Crane, writing; E. B. Denison, boards; Thomas Duncan, book; E. H. Haskell, dealer; A. L. Hollingsworth, wrappers; C. W. Lyman, news; A. G. Paine, book; W. H. Parsons, dealer; G. F. Perkins, dealer; Wm. Whiting, writing.

Nominations—A. G. Paine, chairman; J. W. French, Warner Miller, G. F. Perkins, W. H. Parsons, E. C. Rogers, Wellington Smith, Wm. Whiting.

Resolutions and Amendments—Warner Miller, chairman; A. N. Burbank, H. G. Burleigh, T. S. Coolidge, W. M. Crane, P. C. Cheney, E. H. Haskell.

Statistics—J. N. Mohr, chairman; W. T. Barker, L. M. Bickford, Chas. E. Bush, C. E. Dean, C. H. Delano, A. L. Hollingsworth, A. G. Paine, Jr., H. W. Southworth, Geo. W. Wheelwright.

Mr. Parsons—Nothing was done in respect to the paper read by Mr. Urquhart. I can only account for it in this way, that the article was so interesting that we failed to do as we ought to have done and thank the gentleman who prepared it. It certainly was full of interest, and I move a vote of thanks.

The President—I would add to that, gentlemen, that we pass the motion standing. (Carried.)

Colonel Paine—Mr. Chairman, the custom has been to pass a vote of thanks to THE PAPER TRADE JOURNAL for the services rendered at our meetings and for preparing the annual pamphlet, and I move that vote.

The President—It is moved and seconded that the thanks of the association be extended to THE PAPER TRADE JOURNAL for preparing the minutes and furnishing us with copies of the minutes of our previous meeting.

The motion was carried, and the meeting then adjourned until half-past 2.

SESSION AT 2:30 WEDNESDAY.

REPORT ON HEADQUARTERS.

J. F. Ackerman read the following report from the committee on headquarters:

Mr. President and Gentlemen: Your committee on headquarters after very diligently and very fully endeavoring to obtain 100 subscribers to the guarantee fund have only succeeded in getting fifty-six, and we do not see where we can get any others. Your committee believe that until 100 subscribers have been secured they cannot do anything more with regard to headquarters. We have received a number of subscribers who are connected with the allied trades, such as machinery, filters and others, who have subscribed even though they did not have the right of membership. We believe, to make the thing successful, it would be necessary to widen the doors for membership in the association. As we cannot see that anything can be done further until the next meeting of the association, your committee beg to be discharged, and consider that they are discharged.

President Chisholm suggested that it would be desirable to continue a committee in view of the importance of the question.

A. J. Ackermann said it would be well to adopt such a plan. The matter had been most carefully considered in all its bearings, and although it would doubtless contribute greatly to the success of the association, yet, as at present organized, the matter of headquarters could not be undertaken except at a great loss to the association, as at present the membership was too small and the dues too low. If a headquarters were established under the guidance of our assistant-secretary it would be a vast help to out-of-town members.

In order to test the extent to which the expense of opening a suitable office would be supported a guarantee fund has been opened, and to which the subscribers for the most part were members of affiliated trades, such as machinery men and supply men. Major Ackerman therefore suggested that the question resolved itself to two points: One was to extend the scope of the membership and alter the by-laws accordingly, and also to increase the dues to a point that would enable the association to stand the expense.

On motion, duly seconded, the president was authorized to appoint a committee to consider the question further, and named the following gentlemen:

Committee on Headquarters — Thos. Duncan, chairman; J. Fred. Ackerman, secretary; T. R. Burgess, T. S. Coolidge, Theo. Conrow, W. B. Dillon, F. A. Flinn, Geo. W. Knowlton, I. G. Luke, Geo. W. Millar, Albert Miller, J. N. Mohr, W. H. Nixon, A. G. Paine, S. F. Perkins, H. W. Southworth, W. F. Whiting.

The president then introduced Mr. I. T. Fanning, who read his paper on the Development of Water Power, that is reported elsewhere in our columns.

Col. A. G. Paine moved a vote of thanks to the reader, and the paper by L. F. Vernon Harcourt on the Conservation of Water Power Abroad was then read by J. Herbert Shedd, A. M. C. E.

After which Mr. Geo. W. Rafter was introduced, and read his paper on the Application of the Principle of Forestry and Water Storage to the Mills of New York State.

The thanks of the association were extended to Mr. Rafter for his very interesting paper.

President Chisholm then introduced Dr. Tolman, secretary of the League Service, who, with prefactory remarks, introduced J. H. Patterson, of the National Cash Register Company, Dayton, Ohio, who gave an able and most interesting talk upon the relations of the employer to the employe. The "talk" was illustrated by stereopticon views of the company's plant at Dayton.

The meeting then adjourned to Thursday at 10:30 A. M.

THURSDAY'S PROCEEDINGS.

When the association assembled Thursday morning J. R. McNeille read a paper upon "The Paper Trade's Association of Europe." J. Herbert Shedd followed with a paper on "Water Power in New England," and Prof. I. N. Hollis read an excellent paper on "The Education of Men for the Industrial Professions and Trades."

A vote of thanks was tendered each reader.

The president then remarked that Prof. Hollis was fully indorsed by almost all the members, at least the officers of the association, for the manner in which he put forth the matter, and it is a thing that our association as an association cannot overlook if it expects to extend its business in competition with foreign competitors; it cannot allow those foreign competitors to be supplied from year to year with an army of trained employees, while on our part we take whatever comes to us, as a rule. We are not at all equipped in the same manner as our competitors.

Arthur C. Hadley, Professor of Political Economy, Yale University, then read a paper on "Industrial Combination: Its Failures and Successes;" which received attention and a vote of thanks.

Pamphlets containing the papers read at the meeting were distributed, accompanied by a book on forestry, which had been prepared by Mr. Pinchot. The meeting then adjourned until 2 o'clock in the afternoon.

AFTERNOON SESSION.

The President—Gentlemen, come to order. The first paper that will be read this afternoon is one that I am sure we are all very much interested in. It is a question as to how best to bring about a confidence between each other in a manner that publicity can be given to the gathering of statistics which will result in the common good free from any injury that could possibly follow to the parties furnishing the information. There is a difference of opinion between some of the members of this association as to how best to bring about such a result, but I think it is almost universal that if it could be brought about, the gathering of reliable statistical information in connection with our trade, and formulated in a manner to be distributed to the manufacturers, would prove very beneficial. Therefore, the article that we are now to listen to becomes doubly interesting in a sense that appeals to a part of our business that is capable of being of great benefit to us. Carroll D. Wright, LL. D., United States Commissioner of Labor, then read a paper, entitled, "The Value of Statistics." A vote of thanks was tendered Mr. Wright, and the paper ordered printed in the proceedings.

A paper was read by A. S. Capehart, director of Liberal Arts and Chemical Industries, in which he stated that he had been requested in behalf of the Commissioner-General of the Paris Exposition, who was unable to be present. The paper was received with great interest, and at its conclusion Mr. Capehart arranged to send members of the association, through their committee, instructions concerning the plan of the Exposition, the location of space and its description.

A vote of thanks was tendered Mr. Capehart. A committee on legislation was appointed, consisting of the new president, the new secretary, A. G. Paine, Warner Miller, W. H. Parsons, F. B. Shattuck, William Wenple, H. C. Hastings and C. W. Lyman.

Mr. Smith—Perhaps this would be as opportune a time as any to say that I understand there has been a movement here in the port of New York to levy a duty on paper stuff that has heretofore been admitted free, and I wish that that matter could be taken cognizance of by this association and be referred to the Committee on Legislation and a protest lodged with the proper authorities against the proposed move. This matter was referred to the Committee on Legislation, which was announced as follows: George W. Wheelwright, W. T. Barker, A. M. Burbank, T. S. Coolidge, Thomas Duncan, George S. Knowlton, C. W. Lyman, J. K. Mohr, F. R. Perkins, W. H. Parsons, Jr., George A. Perkins, William Whiting, Hugh J. Chisholm.

The Committee on the Paris Exposition was discharged and a new committee appointed, consisting of Warner Miller, J. Fred Ackerman, W. H. Grahame, E. B. Dickson, Thomas Duncan, E. H. Haskell, A. G. Paine, W. H. Parsons, F. B. Perkins, William Whiting, Hugh J. Chisholm.

The association then voted that the exhbits at the Paris Exposition be made by individual manufacturers under the approval or allotment of space by the committee elected at this meeting, who have charge of the space at the Exposition.

The president then announced the report of the nominating committee:

REPORT OF COMMITTEE ON NOMINATIONS.

Col. Paine—Your committee beg leave to nominate:

For president of this association:
P. C. Cheney.

For vice-presidents:
F. H. Parks.
Writing—W. Murray Crane.
Wrapping—C. A. Dean.
Book—M. M. Armstrong.
Chemical Fibre—George P. Hammond.
Boards—E. B. Dennison.
Dealers—Frank Squier.

For secretary and treasurer:
C. W. Rantoul.

The committee also subsequently nominated George W. Wheelwright a delegate to the National Board of Trade to fill a vacancy occasioned by the resignation of Mr. Barker.

For members of the advisory board of the Philadelphia Museum to succeed the present president and secretary, they nominated T. C. Cheney and C. W. Rantoul.

The President—Gentlemen, you have heard the report of the committee on nominations. Shall we vote on it as a whole?

Mr. Smith—I move that it be accepted and adopted as a whole.

REPORT OF THE COMMITTEE ON STATISTICS.

Mr. Mohr—The committee concluded that, inasmuch as the government is gathering statistics through its Labor Commissioner, that the secretary could put himself in touch with the government commissioner, and thereby secure the statistics desired much better than we could give them.

In connection with this report, I would state that Mr. Wright reports that only about two-thirds of the paper manufacturers have handed in reports, and we suggest that the rest do it as soon as may be convenient.

The report was accepted and adopted, and the committee discharged.

Mr. Smith—I move that the Committee on Legislation take up the matter of an assessment of duty on paper stock which the Tariff Law says shall be admitted free, and that they protest against any such assessment of duty on paper stock which is used for the manufacture of paper only.

The President—It was voted that the assessing of duty on paper stock be referred to the Committee on Legislation, with instructions that they protest against it.

REPORT OF COMMITTEE ON PRIZES.

Mr. Mohr—In the absence of the chairman of the Committee on Prizes, I would like to report this:

It has occurred to the present officers that the usefulness of the association could be extended by its encouraging meritorious investigation and invention by giving an annual prize for the best essay and the best invention. The ideas of the present officers are embodied in the accompanying draft of resolutions, which are tendered, however, merely as a basis for discussion by ourselves. Should you favor the idea, please fix upon the amount of the prizes, and such other conditions as you think best.

Whereas, the success of the majority of paper manufacturers is dependent upon the success of the paper-making industry as a whole, and, whereas, the continued growth of the exports of paper from the United States is dependent upon the superiority of our methods in machinery;

Therefore, be it resolved, That this association, to these ends, offer annually a prize of the value of two hundred dollars for that invention by an American which shall be deemed by a committee appointed for the purpose at each annual meeting, to have contributed or to promise to contribute most to the advancement of the interests of paper-making. Said committee to have the matter in charge during the year following their appointment, and to announce their award at the succeeding meeting. In case no invention submitted shall be deemed sufficiently meritorious no award shall be made.

Whereas, it is greatly to the benefit of the paper industry of this country to disseminate knowledge relating thereto, resolved that the association offer annually a prize of $100 for the best essay presented on some subject pertinent to the paper industry, and that this prize be open to the world. The conditions otherwise to be the

(*Continued on page 129.*)

TABLE SHOWING THE DAILY CAPACITY (*NOT PRODUCTION*) IN POUNDS OF THE PAPER AND PULP MILLS OF THE UNITED STATES NOW RUNNING, AS REPORTED BY MANUFACTURERS FOR INSERTION IN THE TWENTY-FOURTH EDITION OF LOCKWOOD'S DIRECTORY OF THE PAPER TRADE, 1898-9.

PREPARED BY THE HOWARD LOCKWOOD PUBLISHING COMPANY FOR THE USE OF THE TRADE.

STATES.	FINE PAPER.	BOOK PAPER.				NEWS.	WRAPPING.			BOARDS.						Tissues (d)	Blotting.	Build'g, Roofing and Sheathing.	Carpet Lining.	Curtain and Hanging.	Miscellaneous. (e)	Ground Wood Pulp.	Soda Fibre.	Sulphite Fibre.	Total by States.
	Writing. (a)	Book. (b)	Cover.	Plate, Litho. Map, etc.	Card Board, Card Middles, Tickets, etc.	Roll.	Manilla, Real and Bogus.	Heavy Wrapping. (c)	Straw Wrapping.	Bind'r's and Trunk.	Leather	Press and Album	Straw Boards.	Wood Pulp Board.	News Boards.										
Alabama	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	4,000	....	....	4,000
California	....	....	....	....	....	....	8,000	12,000	....	4,000	....	....	4,000	....	....	....	....	....	....	....	....	20,000	....	....	48,000
Colorado	16,000	16,000	....	....	....	....	....	2,500	2,500	....	....	....	....	....	....	....	....	2,500	2,500	....	....	32,000	....	16,000	90,000
Connecticut	36,000	84,000	15,000	....	21,500	34,500	48,000	31,000	24,000	60,800	22,800	22,000	15,300	24,000	100,000	23,200	6,000	15,500	....	3,500	....	....	....	....	587,100
Delaware	5,000	40,000	....	....	....	25,000	17,000	....	....	....	....	....	....	....	....	180	....	....	....	....	....	....	70,000	....	157,180
Dis. of Columbia	....	5,000	....	....	....	....	3,000	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	8,000
Georgia	....	5,000	....	....	....	....	36,000	....	....	....	....	....	....	....	....	....	1,000	....	....	....	....	9,000	....	....	51,000
Illinois	....	....	....	....	....	....	....	6,000	191,000	....	....	....	330,000	....	....	....	....	30,000	20,000	....	....	20,000	....	....	597,000
Indiana	....	50,000	....	....	....	20,000	62,000	10,000	56,000	30,000	....	....	472,000	80,000	16,000	4,000	....	80,000	4,000	....	....	186,000	90,000	....	1,160,000
Iowa	....	....	....	....	....	....	....	8,000	42,000	....	....	....	30,000	....	....	....	....	....	4,000	....	....	....	....	10,000	94,000
Kansas	....	....	....	....	....	....	10,000	....	17,000	....	....	....	7,000	....	....	....	....	....	....	....	....	....	....	....	25,000
Kentucky	....	25,000	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	3,515,000
Maine	....	202,000	....	....	....	845,000	233,000	20,000	....	....	31,000	....	....	88,000	....	....	....	....	....	....	....	1,326,000	210,000	560,000	34,000
Maryland	....	163,000	....	....	....	14,000	48,000	2,500	31,000	3,000	....	....	34,000	....	....	....	....	2,000	....	10,000	....	25,000	....	160,000	492,500
Massachusetts	585,200	435,000	23,000	63,500	82,500	259,000	168,000	73,000	....	8,000	29,000	2,000	26,000	....	20,000	35,250	20,000	46,000	32,000	47,000	15,000	102,000	....	60,000	2,131,450
Michigan	17,000	132,000	18,000	30,000	4,000	54,000	8,000	64,000	49,000	4,000	....	....	57,000	....	....	4,000	10,000	9,000	....	....	....	134,000	....	106,000	700,000
Minnesota	....	....	....	....	....	59,000	15,000	15,000	....	....	....	....	....	....	....	....	....	25,000	....	....	....	62,000	....	....	176,000
Missouri	....	....	....	....	....	....	....	....	....	....	....	....	3,250	....	....	....	....	....	....	....	....	....	....	....	3,250
New Hampshire	....	103,000	....	....	8,000	347,000	85,000	....	....	....	19,500	....	14,000	....	....	18,250	....	....	....	....	....	437,000	....	460,000	1,491,750
New Jersey	4,000	20,000	....	....	....	....	82,500	16,000	....	38,000	....	....	86,000	10,000	120,000	63,000	....	47,000	13,000	....	....	....	....	....	499,500
New York	52,000	309,000	35,000	....	15,000	1,881,000	539,000	67,000	126,000	60,000	10,000	5,000	109,000	145,000	76,000	95,250	....	126,000	28,000	186,000	94,000	2,788,000	164,000	715,000	7,625,250
North Carolina	....	....	....	....	....	7,000	6,000	....	....	....	....	....	....	....	....	....	....	....	....	....	....	5,000	....	....	18,000
Ohio	30,000	173,000	....	2,000	....	14,000	253,500	60,000	109,000	42,000	....	....	569,000	50,000	....	8,000	12,000	60,000	20,000	....	....	14,000	30,000	36,000	1,502,500
Oregon	....	....	....	....	....	130,000	40,000	....	20,000	....	....	....	....	....	....	....	....	....	....	....	....	123,000	....	52,000	365,000
Pennsylvania	127,530	368,500	15,000	37,000	12,000	....	328,000	13,000	15,000	46,000	3,000	21,000	18,000	....	30,000	35,500	....	222,000	17,000	15,000	6,000	88,000	375,000	90,000	1,872,500
South Carolina	....	....	....	....	....	....	16,000	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	12,000	28,000
Tennessee	....	4,000	....	....	....	....	6,000	....	....	....	....	....	....	8,000	....	....	2,000	....	....	....	....	4,000	24,000	....	48,000
Texas	....	6,000	....	....	....	....	15,000	....	5,000	....	....	....	....	....	....	....	....	4,000	....	....	....	....	....	....	30,000
Vermont	16,000	....	....	....	....	222,000	142,000	....	....	....	6,000	....	5,000	29,000	....	14,500	....	....	....	10,000	....	388,000	....	60,000	892,500
Virginia	16,000	6,000	....	....	4,000	....	10,000	....	....	....	....	....	20,000	....	....	2,000	20,000	....	....	....	....	12,000	40,000	....	130,000
Washington	....	12,000	....	....	....	12,000	24,000	12,000	....	....	....	....	....	....	....	....	....	....	....	....	....	20,000	30,000	15,000	125,000
West Virginia	....	....	....	....	....	....	7,000	....	19,000	....	....	....	24,000	....	....	....	....	....	....	....	....	90,000	....	50,000	190,000
Wisconsin	118,000	23,000	10,000	....	....	792,000	133,000	....	50,000	....	....	15,000	15,000	20,000	....	47,000	....	25,000	25,000	....	....	886,000	....	437,000	2,596,000
Totals	1,042,700	2,181,500	116,000	132,500	147,000	4,715,500	2,343,000	412,000	756,500	295,800	121,300	65,000	1,838,550	454,000	362,000	340,130	71,000	694,000	165,500	271,500	115,000	6,775,300	1,033,000	2,839,000	27,287,480

(a) To include all grades of bank-note, ledger, flat and folded, tub and engine sized, envelope, parchment, bond, record and drawing papers, telegraph and writing manilla, etc.
(b) To include all grades of book paper not otherwise specified.
(c) To include hardware, ham, express, tobacco and mill wrappers, etc.
(d) To include all grades, colors and kinds of stock: toilet, carbon, copying and cigarette papers, etc.
(e) To include ribbon, tea, and all papers not classified elsewhere.

Correspondence.

WATERTOWN.

[FROM OUR REGULAR CORRESPONDENT.]

WATERTOWN, N. Y., February 16, 1899.

A large delegation of paper manufacturers left this city this week to attend the annual meeting and banquet of the American Pulp and Paper Association. Among the number were George C. Sherman, treasurer of Taggart's Paper Company and also of the new St. Regis Paper Company; Seymour Knowlton, general manager of Knowlton Brothers; Fred Herring, treasurer of Jefferson Paper Company; Charles Outterson, manager of Outterson Paper Company; James L. Newton, of the Newton Falls Paper Company; Stewart D. Lansing, secretary of the Bagley & Sewall Company, and Charles N. Sherman, of the Brownville Iron Works. The banquet and the expectations of meeting many old friends has been quite the uppermost topic of conversation this week.

Samuel Allan Upham, treasurer of the Brownville Paper Company, is in California, and has decided to extend his trip to a greater length. Mrs. Upham is with him. They have been all through Colorado and Nevada, and are now enjoying the balmy weather of southern California. He writes that the flowers and warmth contrast very strangely with the letters from the company telling of continued zero weather at home.

The past week has been the coldest on record in the Black River country, and has been one of continuous annoyance to paper and pulp manufacturers. Anchor ice has been rampant: night after night the mills have had relays of men endeavoring to free flume racks from ice, wheels have been completely clogged, and the mills have been shut down for hours at a time. The continued cold is having the effect of drying up the river, as many of the smaller feeders are frozen tight.

But little change has been experienced in the market during the past week. The prices on manillas remain about as they have been for the past few months. The Watertown Paper Company's machines continue to be run on this class of papers, while the Remington Paper Company has two of its machines also on them, as it has for some time past. The Taggarts, too, are turning out the usual quantity. Butchers' and No. 1 manillas are made in this section, there being but little No. 2 turned out. There is a fair demand for the grades manufactured in the valley, all the mills reporting the same thing. The International people do not make butchers', though the machines in some of their mills are running on Nos. 1 and 2. Manilla makers throughout this section appear to be satisfied with the present situation.

The weather that the section is at present experiencing is excellent for getting out spruce pulp wood in large quantities, and the gangs in the woods are improving the opportunity. Shippers are now sending large carloads of pulp wood to the various mills along the Black River, and, thanks to generally unimpeded tracks, excellent arrangements against the warding off of storms prevailing this season, the shipping is going on uninterruptedly.

The new mill of the Remington Paper Company at Glen Park is now practically finished. It is a substantial brick and stone building, a story and a half in height, and is an ornament to the village. The machine, which was made by the Bagley & Sewall Company, is now being set up. The probabilities are that the mill will be running in a couple of weeks.

Work is progressing in the works of the Bagley & Sewall Company on the new cylinder machine for the Carthage tissue mills, ordered recently by James Outterson, to add to the two machines already in the mills. The new one will be ready in the early spring. The splendid record of the new machine recently put in the ironite mill of the C. R. Remington & Sons Company, at Glen Park, is a source of great satisfaction to the Bagley & Sewall people, as they "laid themselves out," to use a trade term, on the big fellow. After it has been running a little, still bigger results are looked for.

H. W. Stebbins, of the firm of Stebbins & Richter, consulting engineers in the sulphite and paper mill line, has just returned from Potsdam, where he has been doing extensive work for the Racquette River Paper Company. The Racquette River people have near Potsdam a two-machine mill where they manufacture manillas. In connection with their paper mill they maintain an extensive sulphite plant, and it is in this building that Mr. Stebbins' efforts have been mostly made use of. The digestors have been relined, and other improvements and changes made in the plant. The Mitcherlick patents were employed largely by Mr. Stebbins in his work. He was there eight weeks, and leaves the sulphite plant practically remodeled. The original method was largely improved, Mr. Stebbins having incorporated new ideas which he has gained as the result of much experience. While he was there he was entertained one evening by the Citizens' Club of Potsdam, a social organization made up for the most part of paper manufacturers and other manufacturers of the thriving village. On this occasion Judge Swift, largely interested in Potsdam's industrial affairs, and the assignee of the High Falls Sulphite Pulp & Mining Company, presided, and made an admirable address on the subject of "The Navy." Mr. Stebbins also spoke briefly. Stebbins & Richter are busily engaged at present in getting out preliminary plans and estimates on several proposed new mills, and have enough work outlined to keep them busy for some time.

The Brownville Iron Works, of whose affairs a young business man, Charles N. Sherman, now has active charge, is as busy as ever these days. Five Gotham screens were recently shipped to Germany, and three screens were lately installed in the Remington Paper Company's No. 4 pulp mill at Glen Park. The Frontenac Paper Company recently put in a screen in the mill at Dexter, and one was shipped last week to the Orono Pulp & Paper Company, Bangor, Me. The Ornamite Veneer Company, of this city, has also ordered one.

A very pleasant wedding occurred at the home of Mrs. Alphena Christie on Wednesday of last week, the marriage of Mrs. Christie to Albert Holbrook, of Dexter. Rev. W. A. Roulston officiated. Mrs. Christie was one of Dexter's best known ladies, and Mr. Holbrook is a foreman in the digester department of the Dexter Sulphite Company's mill, which position he has occupied for a number of years. Their many friends extend congratulations.

State Engineer and Surveyor Bond, accompanied by Division Engineer Gere, of Syracuse, were in Fulton, N. Y., Tuesday of last week, and drove to Minetto to inspect the dam there, also the high dam, both of which are to be raised. The material for the work is on the ground, and it is expected that operations will begin as soon as possible after the spring floods have subsided. The dams are to be raised about two feet. A Syracuse firm has the contract. This is the only State public work that is looked for in this part of the State the coming summer. It will undoubtedly give employment to many men and a number of teams. The improvement to the dams will necessitate the raising of the heel-path along the canal in many places. The water powers along the river, which supply three or four pulp and paper mills, will also be improved by making the dams higher.

The following are several annual reports of local pulp and paper concerns as filed with the county clerk:

Annual report of the Carthage Sulphite Pulp Company: The capital stock is $40,000, the debts do not exceed $60,000 and the assets are at least $75,000. The Beaver River Lumber Company, of Crogan: The capital stock, $50,000, all paid in; assets, $200,000; liabilities, $81,000.

The Remington Paper Company and the C. R. Remington & Sons Company have issued a call to their stockholders to attend a meeting to vote upon a sale of their entire plants to the International Paper Company. The meeting is to be held on February 18, 1899, and it must be inferred that a sale has been consummated to the satisfaction of at least the controlling interests in each company.

B. B. Taggart, president of Taggart Brothers' Company, has decided to embark in the hotel business, and with ex-Mayor Hiram F. Inglehart, of this city, has concluded negotiations for the lease of the Hotel Normandie, at Broadway and Thirty-eighth street, New York, and become the proprietors of that important establishment. It is one of the well-known hotels of the metropolis and admirably located. Mr. Inglehart and Mr. Taggart have had an extensive hotel experience, and all properties of that class that have passed under their control have prospered and brought gratifying returns. This is, of course, the largest enterprise that they have undertaken.

F. M.

FOX RIVER VALLEY.

[FROM OUR REGULAR CORRESPONDENT.]

APPLETON, Wis., February 14, 1899.

This part of the country is just getting out from beneath the clutches of the most long-continued and severe cold weather in public remembrance. For nearly three weeks the thermometer has been continually below zero, sinking at night in some cases to more than 40° below. Not only have people suffered but business of most kinds has been almost wholly suspended. The paper mills have gotten along better than might have been expected. Their principal difficulty has been in getting coal, sulphite and raw materials of various kinds, as the railways have frequently been tied up on account of the cold; but none of the mills has been compelled to shut down, though it has occasionally been averted by a narrow margin. Frost formed on the windows and sometimes on the

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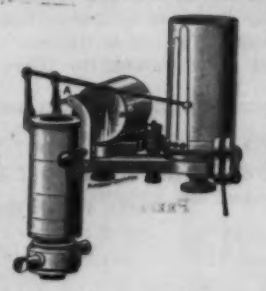

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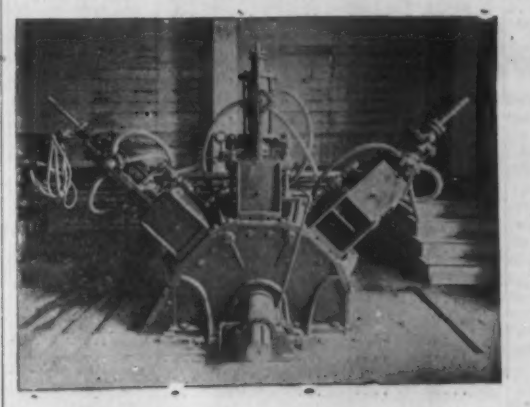

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The Jeffers Suction Screen.
Made in three sizes: 8, 9 and 10 Plates.

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Three-Pocket Wood Pulp Grinders.

FITTED WITH ROLLER BEARINGS. - - A GREAT SAVING IN POWER

The Only Builders of a Steam "DRAG SAW."

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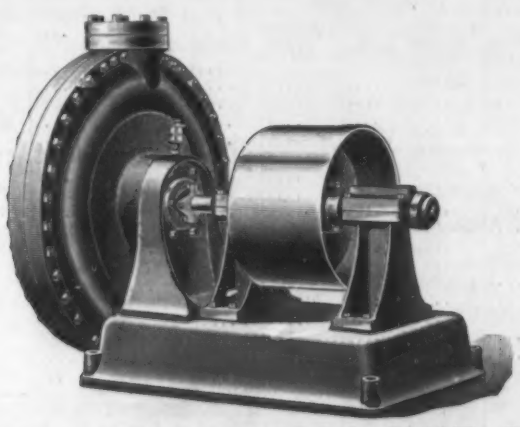

THE HARMON MACHINE CO.
WATERTOWN N. Y.

REMOVAL. The U. S. AEROPHOR AIR-MOISTENING and VENTILATING CO., of Providence, R. I., will locate their office in BOSTON, Mass., at 45 MILK STREET, where on and after JANUARY 1st, 1899, all correspondence should be addressed to THE AEROPHOR COMPANY, our title having been changed, to take effect 1st inst.

FRANK B. COMINS, Vice-Prest. and Genl. Mgr.

walls of the mills in such quantities that when the cold moderated and it commenced to melt the floors were flooded, and great piles of stock have had to be moved to keep it out of the wet.

In general business is very good. One manufacturer of flat papers tells me he has orders ahead for more than 600 cases of these goods. Book papers are in fairly good demand, and print papers continue firmer in tone, caused undoubtedly, as stated last week, by the restricted production of some of the mills on account of lack of power.

Nothing particularly new has transpired respecting the writing paper combination. There are just four mills in Wisconsin that would be affected by the combination. They are those of the Gilbert Paper Company, Menasha; Shattuck & Babcock Company, De Pere; Fox River Paper Company, of Appleton, and the Plover Paper Company, of Stevens Point. As has been stated previously in this correspondence, the disposition of the manufacturers toward the enterprise has been quite favorable, and this being an era of trusts and combinations, the probabilities would seem to favor the idea that the combination will be actually formed. It is understood that the East is quite confident that the West is anxious to go in, which is another confirmation of the old truth that one must go away from home to learn the news. Mr. Shibley, of the firm of Dean & Shibley, is understood to be on his way to this valley, having stopped in Milwaukee, where he is interested in some other deal of a similar nature, and it is said he feels quite confident of arranging with the manufacturers here to his entire satisfaction on the occasion of his second visit. Whether fruition or disappointment awaits him your correspondent will probably be able to tell very shortly.

It was interesting to friends in this valley to learn, through THE PAPER TRADE JOURNAL of last week, of the new enterprise in which Garrett Schenck is evidently the moving spirit, the new Great Northern Paper Company. Mr. Schenck lived in Appleton for several months long ago, when sulphite was a comparatively new product, being engaged in installing his bronze digesters in the mill of the Atlas Paper Company, and in teaching the sulphite process to the men who were to operate the plant. He was recognized as a thoroughly thoughtful, scientific, well-informed and capable man. If the management of the new enterprise is to devolve upon him it will be in good hands.

During the past week or ten days four cases of small-pox have developed in Appleton, the last one being reported this afternoon. Two girls, one man and a boy are the afflicted ones. It is felt that the cases must have originated from the paper mills, as all the people who have been attacked were employed in the rag room of one of the mills here, and there has been no other source as far as known from which the contagion could have been communicated. The cases have been thoroughly isolated, and no fear is felt of any spread of the disease. There is very little of the excitement over the disease which has in the past sometimes been a feature of similar occurrences.

The installation of the new digester at the mill of the Kaukauna Fibre Company some time ago has necessitated the placing of a good deal of additional machinery to handle the increased product. A large, new wet machine is one of the recent additions. Last week a new screen was installed, and this week another is to be put in.

It is reported from Chicago that the Chicago Dispatch has been sold for $1,000 to W. P. Dutton, who represents the Combined Locks Paper Company and the George B. Carpenter Company, the largest creditors of the defunct newspaper. The sale was made under order of the court. Joseph Dunlop, the former owner, who was sent to Joliet upon conviction of having made the paper objectionable for transmission through the mails, has lately been released, and it is thought that he may take hold of the paper again.

FOX RIVER.

Keep the quantity of stock actually in the mill at the least possible figure. Do the storage in stock houses, not in the mill.

AMERICAN PAPER AND PULP ASSOCIATION.

(*Continued from page 127.*)

same as those relating to the prize for the best invention.

The report was accepted, the resolution adopted and the committee discharged.

REPORT OF COMMITTEE ON RESOLUTIONS.

The following was reported by the committee on resolutions:

MERCHANT MARINE SERVICE.

Whereas, Control of the ocean carrying trade is a most important factor in determining the course of international commerce.

Resolved, That it is the sense of this association that the National Government should foster by all means in its power the development and maintenance of our merchant marine service.

PHILADELPHIA MUSEUMS EXHIBIT.

Whereas, The development of our foreign commerce would contribute greatly to our national prosperity; and

Whereas, The Philadelphia Museums from the most patriotic motives has arranged for holding an exposition of the American products and manufactures, especially suited for export, at Philadelphia, in the year 1899; therefore

Resolved, That this association appeals to the manufacturers and dealers in the paper trade throughout the United States to contribute to the success of this most praiseworthy enterprise by making exhibits of their products and goods and in every other way within their power.

PAPER DEALERS' DIVISION.

Resolved, That a new division of the association be and hereby is created, to consist of paper dealers; and that such division shall have a vice-president, who shall represent it in the executive council.

ABOLITION OF WOOD PULP DIVISION.

Whereas, The manufacturing for sale in the market of wood pulp, independently of paper mills, has shrunk to such a small proportion through the building of paper mills in connection with pulp plants.

Resolved, That the division of the association, known as the Wood Pulp Division, be and is hereby abolished.

CREATION OF DEPARTMENT OF COMMERCE AND INDUSTRY.

Whereas, The manufacturing and commercial interests of the country exceed all other interests in importance.

Resolved, That we favor the establishment by the General Government of a Department of Commerce and Industry, and the appointment of a secretary to represent the same in the cabinet.

ORIENTAL COMMERCE.

Whereas, The commerce of the Orient is of the greatest importance to the United States; and

Whereas, The trade is largely controlled by the shortest and cheapest lines of transportation; therefore

Resolved, That we favor the speedy building the Nicaragua Canal and urge upon Congress the desirability of the National Government undertaking such construction.

DEATHS OF EX-PRESIDENTS.

Resolved, That this association greatly deplores the loss which has fallen upon the paper industry through the deaths of the association's ex-Presidents, Byron Weston and William A. Russell,

Mr. Parsons—Before we adjourn I do not feel that we should go away from here without some recognition of our appreciation of the work which has been done by the officers of this association during the past two years.

It is very pleasant for us to come to these meetings and have these interesting papers read to us, and probably go away without a thought as to the immense amount of labor of which it is all the outcome, and it seems to me when we listened to the report of our secretary and treasurer that we must all have felt that certainly if we had not made any progress during the many years of our existence until two years ago we had made up for it during the past two years. Now, as an ex-president of the association, who has many faults to atone for in the way of neglect of duty, I feel that we ought to put upon record in a substantial way our appreciation of the services of our president and secretary, and I move that a committee be appointed to draft suitable resolutions in this respect.

The motion was carried, and a committee appointed consisting of Mr. Parsons, Mr. Smith, Mr. Rogers and Senator Miller.

The President—If there is no further business to come before the association, a motion to adjourn until the banquet this evening is in order.

On motion, the meeting adjourned.

Bank Note Company Officers.

At the annual election of the American Bank Note Company, New York, trustees were elected as follows for the ensuing year: Phineas C. Lounsbury, James Macdonough, Augustus D. Shepard, J. Truro Robertson, Theodore H. Freeland, Joseph S. Stout, Jared K. Myers, John E. Currier, Edmund C. Converse, James B. Ford, Robert N. Toppan, Felix Campbell and Charles A. Moore. The trustees then elected the following named gentlemen as officers: James Macdonough, president; Augustus S. Shepard and J. Truro Robertson, vice-presidents; Theodore H. Freeland, secretary and treasurer; John E. Currier, assistant secretary, and Jared K. Myers, assistant treasurer.

Dandy rolls should be counterbalanced, especially when made very heavy, as is sometimes the practice. An English concern produces an excellent device for the purpose, which is so constructed that the weights may be placed at will upon the lever arms and a dandy roll of any weight may be entirely counterbalanced or any part of its weight can be allowed to bear upon the paper.

To guard against the clogging of the immense turbines of the Niagara Power Company with floating ice men are stationed along the canal with rakes and dipnets, to remove any cakes that may come within range. The suction of the penstocks is not so powerful as to draw the ice down before it can be caught.

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Universally Approved and Accepted by Underwriters Throughout the United States.

A MICA SEATED VALVE

that is Non-Corrodible, Non-Adhesive, Impenetrable, Imperishable. Simplest Construction. Most Sensitive to Heat. More Accessible to Sudden Fire.

The most effective distributer of water, whether used upright or pendent. . . . .

For any information concerning Sprinkler Service apply to

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LEVIATHAN BELTING

Running a Beating Engine will last longer and do more work than any belt made. *Uninjured by Heat, Steam or Water.*

Belts for Main Driving and Work of a Heavy Nature a Specialty.

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Sole Manufacturers, 1219-1235 Carpenter St., Philadelphia.

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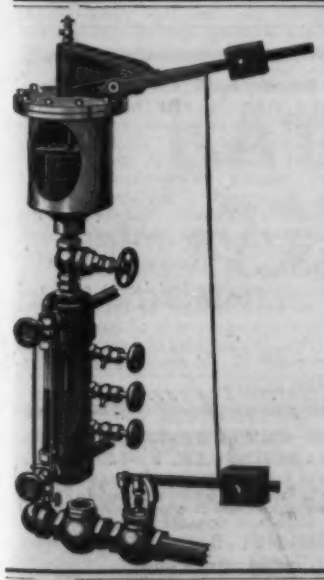

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This Regulator automatically regulates the feed, so as to supply the exact amount of water that is being converted into steam, keeping the water in the boiler at an invariable, fixed height under all circumstances. It secures drier steam, higher pressure, *with less fuel*, and great uniformity in pressure. It avoids the injurious effects produced by the unequal expansion and contraction that takes place where the height of the water in the boiler varies, and other causes that often result in fatal explosions and accidents that are generally placed under the head of "*Another Mysterious Boiler Explosion.*"

It is simple, durable, correct in principle, and absolutely perfect in operation. It has been subjected to the severest tests, under a great variety of conditions, and has given complete satisfaction in every case.

S. D. WARREN & CO.,	21	Regulators,	Cumberland Mills, Me.
STEVENS & THOMPSON,	3	"	North Hoosick, N. Y.
WALLOOMSAC PAPER CO.,	3	"	North Hoosick, N. Y.
ORRS & CO.,	8	"	Troy, N. Y.
JAMES KAMAGE PAPER CO.,	2	"	Monroe Bridge, N. Y.
MARTIN & WM. H. NIXON PAPER CO.,	14	"	Philadelphia, Penn.
SPRECKLES' SUGAR REFINERY,	30	"	Philadelphia, Penn.
R. TULLIS & CO.,			Markinch, Scotand.
ALEX. COWAN & SONS,			Penicuik, Scotland.
DONSIDE PAPER MILLS CO.,	2	"	Aberdeen, Scotland.

J. J. LOWDEN, Everett, Mass.

WEST END ENGINE WORKS CO., Edinburgh, Scotland,

SOLE EUROPEAN AGENTS.

GEIPEL'S PATENT STEAM TRAP.

GUARANTEED STEAM TIGHT.

THORPE, PLATT & CO., 103 Cedar St., N. Y.

VALVE CAN BE GROUND IN PLACE.

SIZE No 2 MEASURES 23" X 6" X 4" OVER ALL.

Can be entirely taken apart, cleaned and put together again in 5 minutes.

This trap is a steam tight, automatic bleeder. Write for full particulars, sizes and prices.

E. D. JONES & SONS CO.,

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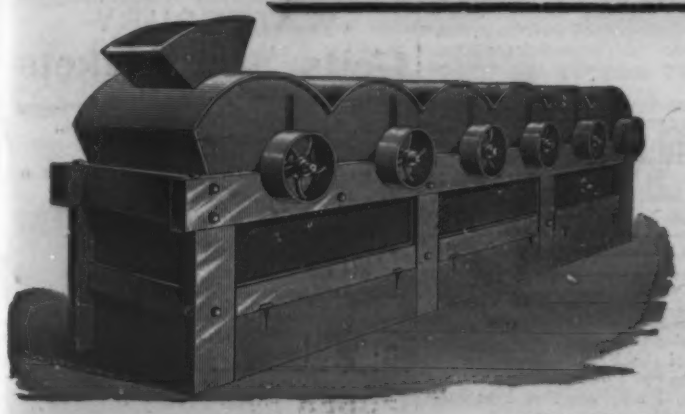

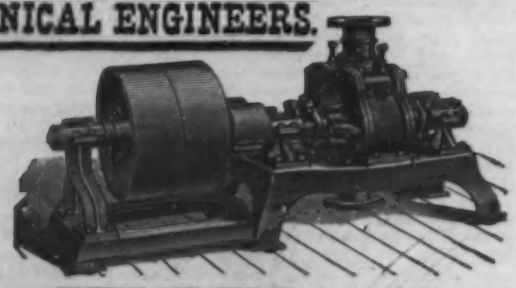

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Rotary Pumps and Turbine Water Wheels.

SHAFTING, PULLEYS, HANGERS AND GEARING.

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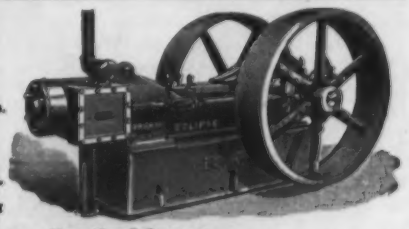

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DEALERS IN

Cotton Dryer Felts,

ALL WIDTHS AND WEIGHTS.

24-26 Market St. CHICAGO.

THE BANQUET.

On Thursday evening the annual banquet of the association was held in the Grand Ball Room of the Waldorf-Astoria, and was very largely attended, extra tables being added to accommodate the diners.

President Chisholm presided, being flanked on the right by Mr. Herbert M. Wilson, Mr. Wilbur F. Wakeman, Mr. George R. Rafter, Mr. J. T. Fanning, Mr. John H. Patterson, Dr. George A. Dixon, Mr. J. Herbert Shedd, Mr. George F. Perkins, Major Z. K. Pangborn, Mr. William H. Parsons, Hon. John S. Wise, Mr. D. O. Mills, Hon. Timothy L. Woodruff, and on the left by Hon. Whitelaw Reid, Rev. Dr. Robert S. MacArthur, Hon. Roswell P. Flower, Col. Augustus G. Paine, Professor Arthur T. Hadley, Hon. Warner Miller, Professor Ira Nelson Hollis, Col. J. W. French, Hon. Carroll D. Wright, Mr. Chester W. Lyman, secretary; Mr. Ripley Hitchcock, Mr. F. H. Newell, Rev. Dr. E. C. Bowles and Dr. W. P. Wilson.

Among those at the other tables were: Hon. Jonathan Dixon, Wm. V. Toffey, Hon. Frank Squier, Don. C. Seitz, John H. Duffy, A. B. Paddock, C. M. Palmer, Frederick Vilmar, Wm. H. Nixon, Major John J. Riker, W. D. Woodruff, Jean Freese, J. Fred Ackerman, G. B. Hanford, F. W. Spicer, Geo. F. Perkins, D. A. Bullard, B. F. Reist, J. Fred Webster, Chas. M. Fairbanks, L. M. Bickford, Edwin Riley, Wm. N. Mann, O. C. Curtis, H. O. Phillips, Allan M. Fletcher, Frank W. Fletcher, Geo. Reuter, Jr., F. W. Kinsman, Jr., H. E. Tidmarsh, W. F. Ford, Hugh R. Blathen, B. F. Horne, J. C. Morgan, Chas. E. Bush, Geo. E. Hall, C. W. Rantoul, Jr., W. V. Wentworth, Chas. R. Burleigh, L. W. Stockwell, C. S. Merrill, J. W. Boothe, W. N. Chapin, J. E. Linple, A. N. Burbank, B. M. Jackson, R. B. McEwan, Herman Behr, Homer J. Locke, J. W. French, E. B. Denison, Wm. F. S. Brown, J. C. Duncan, A. G. Bailey, H. M. French, A. S. Apger, L. H. Biglow, F. H. Platt, S. G. Whiton, L. Benedict, A. J. Cody, N. R. Hopkins, H. W. Newton, B. F. Elson, James Bennett Forsyth, A. W. Clapp, C. H. Delano, E. H. Clapp, E. W. Hyde, Olin Scott, C. C. Woolworth, John S. Graham, W. R. Sheffield, Dr. H. Schweitzer, Wm. Diestel, I. J. R. Muurling, Louis I. Waldman, Wm. Lesser, D. W. Mabie, W. H. Claflin, H. H. G. Ingalls, Martin Cantine, F. M. Price, Nicholas J. Barrett, J. T. Emerson, Wm. A. Whitney, J. H. Murphy, J. V. Bruyn, F. L. Dewey, H. C. Boyd, G. H. P. Gould, H. H. Nevins, B. H. Snell, D. H. Doremus, Hiram Allen, Loren Allen, Marcus Allen, Samuel F. Figgis, Theodore G. Ward, C. O. Grim, Ed. G. Ward, A. Miller, Chas. C. Walden, L. Alers-Hankey, Evan Johnson, James F. Hobart, Edwin F. Treat, A. B. Daniels, E. J. Noble, J. G. Mackintosh, H. J. Stratton, Geo. P. Hitchcock, F. J. Harwood, Alexander M. Orr, F. W. Orr, Robt. F. Hobbs. Wm. C. Martin, A. G. Paine, Jr., Alfred Rindskopf, M. M. Armstrong, A. G. Elliot, Jr., M. B. Strat, J. H. McCormick, J. B. Lyon, Geo. Plamondon, Wm. W. Page, Geo. W. Hammond, W. F. 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Peard, F. C. Whitehouse, David S. Cowles, Robert Crawford, N. M. Jones, John Eastwood, E. L. Millard, James B. Mullen, John Mullen and John N. Merrill.

The post-prandial exercises were begun by President Chisholm, who spoke as follows:

Members of the American Paper and Pulp Association and Friends—The officers of this association extend to you a most hearty welcome, and on behalf of the members and officers of this association I tender the sincere thanks to the gentlemen who have prepared with such care and ability, and read the different papers during the past two days. The large number present indicate that there is a general interest in the present and future welfare of this association, and I trust that the efforts of our successors in office will meet with the cordial support that the retiring officers have received.

The first toast is, "Our National Opportunities," and will be responded to by one who has an international reputation, and upon whom there has been bestowed well-merited honors, he having filled with great distinction the various high positions which he has occupied. I have the honor and pleasure of introducing the Hon. Whitelaw Reid.

RESPONSE OF HON. WHITELAW REID.

Mr. President and Gentlemen of the Association—After concurring most heartily in the words which your president has uttered concerning the success of this meeting, and, above all, of this dinner, I desire to add that it has been a very deceptive dinner. It began with a deception, which took in not only so humble an individual as myself, but one of the highest functionaries of the State. When the Lieutenant-Governor of the State and myself found ourselves poising our heads over a delicious bouquet of Jacqueminot roses and saying how beautiful they were and how exquisite their odor, and how, when we suddenly discovered that the odor was a little deficient and looked blankly at each other when we made the discovery that, after all, these beautiful roses were merely paper, it dawned upon us that perhaps this magnificent audience, such as any impresario would be delighted to gather, might also be papered. [Laughter.] A little later there came on an ice which deceived the very elect, for I found that your president and myself were exhausting the capacities of the forks of the Waldorf-Astoria in attempting to penetrate what proved after all to be a bad imitation of sulphite from your paper mills. [Laughter.]

And those are not the only deceptive features about your dinner, for I find myself suddenly projected into a place in which I do not belong, and vainly essaying to fill the place of my distinguished friend and late colleague, the Senator from Maine, the President of the Senate, or patron saint not only of protection in general but of the paper-makers in particular. [Applause.]

When I had the honor, Mr. President, to decline the invitation with which you favored me to address this dinner, I declined the other end of the feast. I do not mean the feast which you have just met and conquered, the fragments of which lie about you still; but I was to come at the other end of the feast, which is before you, and which may yet conquer and drive you out of the room. Instead of challenging your attention on grave subjects of national concern I was to have had the pleasure of responding to that time-honored toast, in behalf of "The Press," and I expected to appear before you, if I appeared at all—and I distinctly served notice that the chances were that I should not be able to—in the guise of one of the subject race, here to acknowledge your triumph and make my obeisance to the masters of my profession—the men who make the paper we are compelled to consume. [Laughter.]

Somewhat battered and worse for wear after a two-thousand mile experience of the late blizzard on end, together with certain interesting variations in the way of indulgence in another form of element strife, that of speech-making, I come back to find that I am drafted into service to speak to you concerning our national opportunities. I have already warned my friends of my own profession who are gathered busy in front of me that I have no written speech and none in my head; but I wish to call your attention to the extreme audacity of your president and of your committee of arrangement in venturing upon turning an editor loose with his tongue among the paper makers. Perhaps it was Charles Lamb—if not, some of these younger gentlemen of the profession will tell who it was—who once astonished a solid assemblage of English authors by suddenly proposing a toast to the health of that great public benefactor, Napoleon Bonaparte, and when the loyal Englishmen who had not been accustomed to look upon Bonaparte in exactly that light demanded what in the world he meant, he said: "I propose his health because he hanged the publisher." Gentlemen, if I were to appeal to this small and select audience immediately in front of me I am sure they would unite with me most heartily in proposing the health of any man who would hang the paper makers who advance the price of papers. [Applause.] Another of those old chestnuts occurs to me at the moment when I heard my friend, Mr. Warner Miller, who is sitting near me here, make one of his good old appeals for the protection of infant industries, and I remembered the particular infant industry which he had most at heart—the infants are before you. [Laughter.] When I heard him protesting against any repeal of the duties on paper, or pulp, or anything else that might interfere with the growth which it was hoped might in time come to this infant industry, I was reminded of that other old toast presented at a Sunday school, where the celebration had been somewhat interfered with by the infant class, which was more vocal and vociferous than intelligible, when one of the gentlemen who had been addressing the audience under difficulties, from the prize that had attended his remarks, at last in desperation proposed the health of the good King Herod. [Laughter.] There are people who would be willing to propose the health of any good king who would strangle the infants of the paper makers' Judea. [Laughter.]

But, gentlemen, since I have committed the indiscretion or the discourtesy, of referring to one of the officers of our association by name, let me make amends for it by making an honest confession, which is said to be good for the soul. Once in my life I made a mistake [Laughter]. Probably most of you are not willing to make that confession, but I wish to say now, in the presence of witnesses, that once in my life I made a mistake. I thing the paper makers made one first, however. At any rate they suddenly advanced the price of paper, which I think at that time was about 10 cents a pound, and I believe they put it up something like half a cent a pond, and we all saw bankruptcy and blank ruin in front of us, and it swept even the most devoted protectionists off their feet. I think I have a fairly good character in the limited circles in which I am known for loyalty to the principle of protection to American industries, but for once I was willing to unite with my tree trade friends and appeal to Congress for relief from the hand of the oppressor. I went so far as to say that if the paper makers did not see reason Congress would teach them a lesson by repealing the duty on paper and enabling us to import it from Belgium, and it was at that time that Mr. Warner Miller came to see me and read the riot act, as it were. He said to me, first, that he utterly despised the proposition which some of us had advanced that because he was a member of Congress he had no right to vote on a question in which as a private business man he was interested. He said it was true that he had some interests in the question of paper, but he thought that if all people who had no interests in anything that was subject to a tax should be debarred from legislation that it was quite possible that the legislation of paupers would not be any more agreable to the people who had something than the legislation which he proposed, and he then said to me: "I beg to warn you that if you repeal this duty you cripple us and make it impossible for us to develop our industry. If you let this duty alone I promise you that you will get paper cheaper at home than you can buy it abroad." At that time, as I have said, I think we were paying something like 10 or 11 cents a pound for paper. I have seen the time—which these younger gentlemen of the press in front of me have not seen—when I paid 21 cents a pound for paper. I took charge of a rather responsible publishing business in this city, under a contract for a year in advance, to pay 12½ cents a pound for paper. I saw the price gradually sink to 6 cents, and I grumbled then, and I recall with some amusement the fact that at that period in the history of paper production in this country I had the honor to address a convention of members of my own profession in my native State, Ohio, on the hills above Cincinnati, and in that address I undertook to give them some good cheer. I said: Paper can no longer remain at this collossal price; we will not be long content to pay 6 cents a pound for paper when we are able to buy the raw material of which it is made for a dollar and a half a cord [Laughter]. The paper makers of that day considered me a barbarian.

Senator Miller (interrupting)—So you were.

Mr. Reid (continuing)—The Senator says I was a barbarian. But if I was, I was also a prophet, for we have seen paper gradually sinking until it stands now steady to firm [laughter] at 2 cents a pound, with a vast deal of grumbling if it is not up to the standard. And I am now here to say to these gentlemen that I am satisfied; I am not anxious to have paper made any cheaper [cries of "Good! Good!" and applause]. Those of my friends who are engaged in the business of benefiting the public by giving them 3 cents' worth of paper for half a cent., wholesale price, or 1 cent retail, may perhaps think that 2 cents a pound for paper is too much, but I incline to the belief that on the whole the greatest good of the greatest number will probably be conserved by not making paper any cheaper than it is to-day. [Applause.] There is one thing, however, which you can and ought to do, and that is to make it a great deal better for the money.

Mr. President, having made my confession, and having referred to the only subjects that were in my mind when I entered this banquet hall. I shall detain you only an instant longer by any reference to the subject which I find placed for me upon your bill. You ask me to speak of our national opportunities. After the opportunity of the paper makers perhaps I may venture to refer to some of the national opportunities which were probably in the minds of the gentlemen who arranged the toasts. And, first of all, is the opportunity which stands right before us to scuttle away from what we have got. It is quite open to the United States to throw up its hands, say it does not want what it is entitled to and run away. It is quite open to the United States, if it chooses, to refuse to discharge the duties of a self-respecting, responsible nation with regard to the provinces which have been thrown upon its hands. We can, if we choose, say that we will have none of it; that we recognize no responsibilities beyond our borders; that we live within ourselves and for ourselves. It is quite open to us to go further still, and say that we will make of this giant republic of the west a fair match for that ancient Collossus in the east, which is just waking up; that the United States will become a new China, having no interests outside its own borders, declining to undertake responsibilities outside, living here solely for the good of the people on this continent, and for what this continent itself may furnish them. Not such, Mr. President, it seems to me, are the opportunities that fill the eyes of most Americans with red blood in their veins. Not such, I think, the opportunities your toastmaster must have had in mind. I see, on the other hand, before us an opportunity to grasp on the Pacific what we have lost on the Atlantic, the ocean carriage of the commerce of the world on the ocean, which is destined in the twentieth century to carry the greatest commerce of the world. [Applause.]

I think I see an opportunity for the great republic to plant itself directly in front of the awakening empire, which contains within its limits 300,000,000 of souls and to take its full share, or more than its full share, of the enormous trade which their increasing wants and increasing consumptive capacity are sure to develop. I think I see another opportunity for the United States in that magnificent archipeligo which the fortune of war placed at our disposal and which it was ours very recently to accept, or to throw away—an archipeligo of enormous possibilities, economic and stragetic, which no nation in the world is so well fitted to develop and for which no other nation can do so much. I think I see an opportunity to promote a trade, of which the United States has not had enough—a trade between the different zones, a trade with product which we do not have and which we must have, to obtain a monopoly almost of tropical products which hitherto we have been compelled to seek abroad. There is an opportunity for the United States to become the great sugar-producing country of the world. [Applause.] Between Cuba and Porto Rico on our eastern coast, and the islands of Luzon and Eyros and Sabre on the west, we are able to furnish the world with sugar. There is an equal opportunity to furnish a portion of the world with many other tropical products which I need not detain you with to enumerate—rice and hemp and rubber, and other things; and the question which the American people need to consider very seriously and very carefully is, whether they desire to throw away all these opportunities before they have taken time to look at them and consider them. I do not believe that a practical people, a people accustomed to a bargain before they reject it, are going to be in any haste about that decision, and if they only take time to look over the situation and consider the facts I have absolutely no concern as to what that decision is likely to be.

Mr. President, I shall detain this large audience but one moment more, and that is for the expression of a purely personal feeling, which I venture to think is also a national feeling. It has no close relation to the business in hand, but it is feeling which I am not willing to leave this hall to-night without expressing. I am sure you will all agree with me in saying how profoundly we sympathize with the great sister Republic on the other side of the Atlantic in the sudden and awful trial which has this evening befallen it. I express, I am sure, a universal American regret for the death of the President of the French Republic. If I may venture to put a personal tinge in my closing remark, I may say that I had the honor of knowing him first when he was a simple deputy from Havre and when he did us the great service of acting most efficiently and most influentially in the Chamber of Deputies in favor of measures to extend American commerce with France [Applause]. I have known him since through all the stages of his phenomenal period. And I can only say now that in the death of Felix Faure France has lost a President worthy of the best annals of the Republic and America has lost a friend. [Applause.]

The President—The next toast, "Woods and Water Powers," will be responded to by a gentleman who by virtue of his position represents the Empire State. I have the honor and pleasure of introducing to you Lieutenant-Governor Woodruff. [Applause].

Mr. Chairman and Gentlemen—I am often called upon, solely on account of the position I occupy in public affairs, to address, for instance, a company of bankers, as I did the other day, although I possess comparatively little knowledge of banking, or, without a profound theological education, to exhort a Young Men's Christian Association meeting, or, as was the case in this banquet hall the other evening, to deliver a speech to the jewelers of New York with no greater knowledge of jewelry than the inroads it occasionally makes on my pocket-book. But to-night I stand before you, of the American Paper and Pulp Association, in my official capacity as president of the Forest Preserve Board, not only a student and ardent advocate of forest management and cultivation which is so essential to a permanent supply of raw material in the manufacture of pulp and paper, but also a practical conservator of the natural water supply of the State. In addition to this, I am here in a private capacity, for I am a paper and pulp manufacturer myself.

I will not presume to discuss with you the technicalities of paper-making, not simply because you are conversant with all its details, but rather because I fear lest I should arouse your envy, for it is everywhere conceded that the company of which I have been a director for many years produces the best paper that is manufactured in the world. Therefore, I will confine myself to a consideration of the two great subjects about which there can be no contention between us, in which we are all mutually interested, namely, forest cultivation for the continuous supply of raw material, and water conservation for a constant source of power to operate our mills.

There has been, until within the last few years, antagonism between those interested in the preservation of the forests and the lumberman of the State, but these differences will all be reconciled by the important system of forest management sure to result from the original investigation instituted by Col. Wm. F. Fox, the State Superintendent of Forests, and the experiments which have recently been made by Mr. Gifford Pinchot, and his associates, through the encouragement of such men as Doctor W. Seward Webb and Mr. William C. Whitney, with the co-operation of lumbermen whose operations are being directed by the far-seeing presiding geniuses of the International Paper Company. In this connection mention must also be made of the extensive operations in forest cultivation which have just been inaugurated by Cornell University, with Dr. B. E. Fernow in charge, under the fostering aid and financial assistance of the State.

It should be borne in mind that in the virgin forests valueless trees contest the space with the merchantable timber, and, therefore, the cutting out of the useless species and diseased trees is just as necessary as the weeding of a garden. Indeed, forestry is but another name for gardening. Every forest tract has its own peculiar characteristics just as much as different farm lands have—its own adaptability to the growth of certain species, and our own Adirondack region is particularly well adapted to the growth of the spruce which there attains its maximum height and diameter—the species upon which more than any other depends the industries represented here to-night.

The necessity of practical forest care and culture is brought forcibly to mind by the fact that, at the present rate of cutting, it is estimated that the supply of spruce in the Adirondacks will be exhausted within twen-

(*Continued on page 147.*)

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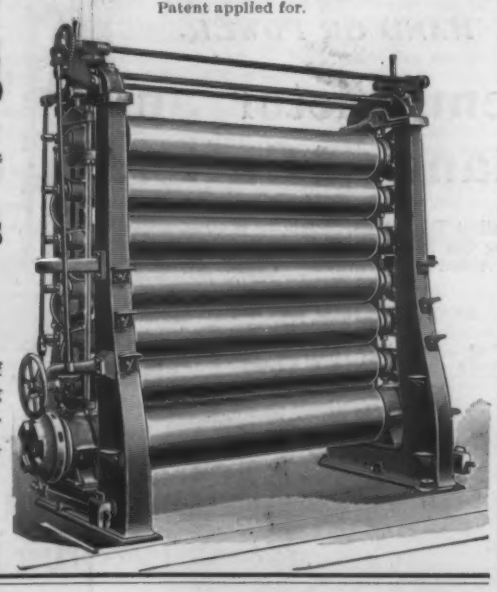

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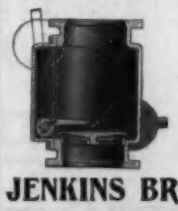

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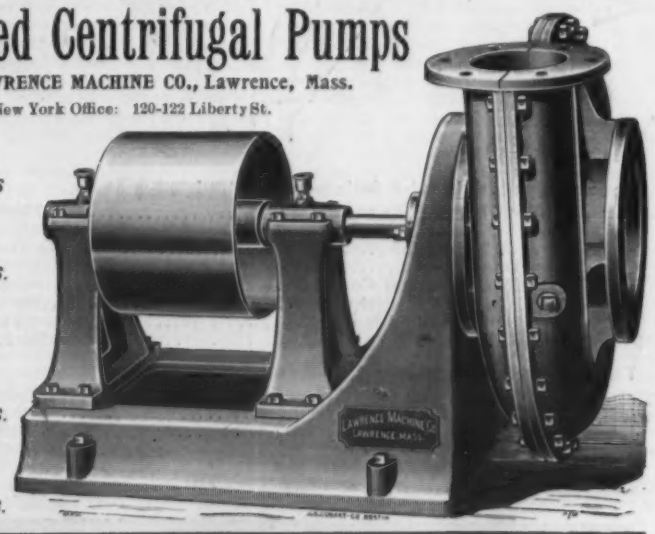

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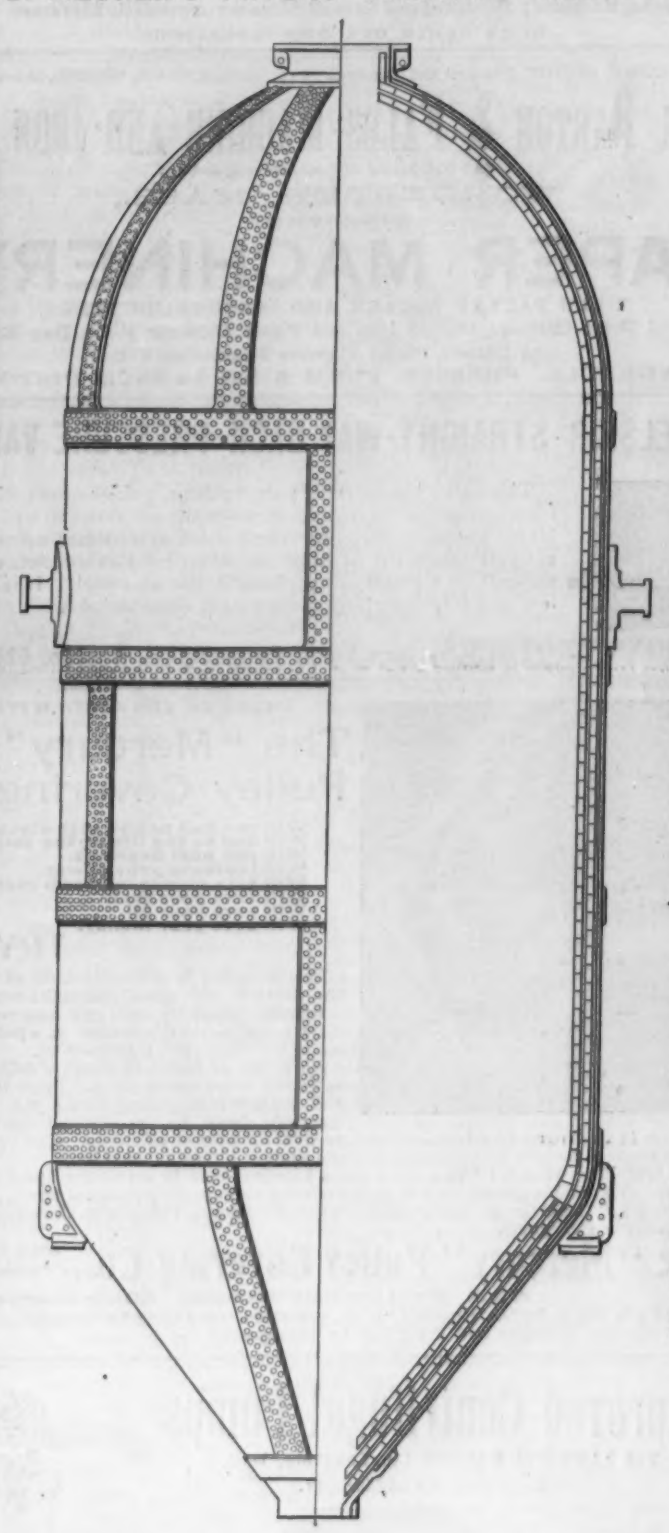

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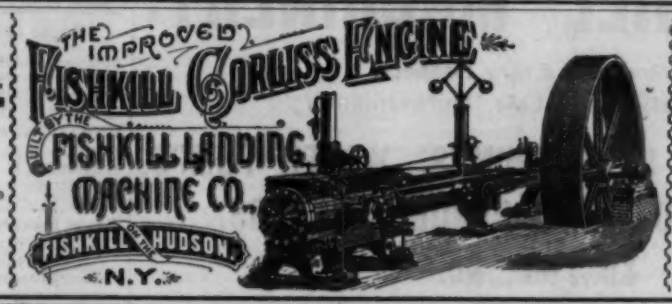

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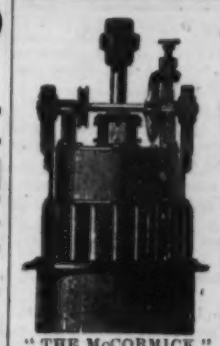

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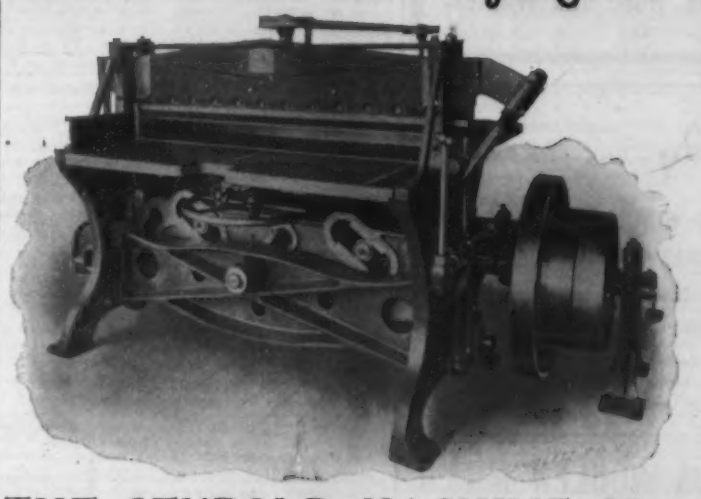

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The Conservation of Stream Flow.

By Wm. Chittenden.

It is the policy of our government not to to undertake works which can, consistently with the general welfare, be done by private agencies, nor to expend the public moneys in any work which benefits mainly or directly a private party only. The function of the state, according to the theory hitherto and now generally held, is to secure to the individual his full share of liberty in the exercise of his calling, but not to appropriate that calling to itself—to make laws under which he may transact business, but to leave such transaction mainly to him.

It is true that much of the present-day teaching as to the proper functions of government by no means accepts as infallible this time-honored theory. A respectable minority of the people in most civilized countries believe that the sphere of goverment action should be widely extended, and that it should absorb many of what are now private businesses. It is urged that the entire tendency of modern industrial life is to link individuals, nations and races more closely together, and greatly to increase the importance of co-operative action. The logical ultimate outcome of this tendency being state control or management of all business enterprises, not a few enthusiasts advocate its immediate adoption, rather than wait for it to come as a distant result of long evolution.

It is not the purpose here to consider the abstract question of the proper sphere of government action further than to call attention to these divergent theories. Whatever may be the justice or soundness of the socialistic doctrine, it is not yet a living issue. In the administration of public affairs it receives no essential recognition. It is, therefore, necessary, in discussing the public management of any business, to be guided by the long-established policy already alluded to: that government will not undertake works which can, consistently with the general welfare, be done by private agencies, nor expend the public moneys in any work which benefits mainly or directly a private party only.

In taking up the specific question of a proposed important extension of the field of public enterprises, such as the conservation of the waste flow of streams, the rule just stated excludes at once a wide range of projects. Wherever the storage of water would inure to the benefit of a private party to such an extent as to make him practically sole beneficiary, and wherever there is no reason of a public nature why he should not be allowed to construct the necessary works, such storage is a matter for the private party to attend to, and not for the general public. All lesser works, therefore, such as mill dams, reservoirs for irrigating single farms, artificial lakes for local pleasure resorts, etc., are not legitimate objects of government expenditure.

It thus becomes necessary to enter a wider field, and to consider those works which affect communities rather than individuals, which are beyond the resources of private agencies to construct, and the control of which by such agencies would be inconsistent with the general welfare. It is to the conservation of stream flow upon a comprehensive scale that this discussion will accordingly be limited.

Before proceeding to the main point of inquiry, it is important to ascertain whether or not there exists any real necessity for such conservation. Only by those who have given some special study to the subject can it be appreciated how great a fund of power exist in the running water of natural streams, nor to what extent this power is rendered valueless by the lack of conservation of their waste flow. If it be estimated that the average annual run-off from the land area of the earth is 6 inches, and that the mean elevation from which this descends to sea is 500 feet, the potential energy of the water at this height will be found to be something like twelve quintmillions of foot tons. If, from this inconceivable quantity, deduction be made for those extensive and peculiar situations where this power could never be utilized, there will still remain in countries of high industrial development an available power in running water greater than the entire fund of utilized power from all other sources. Turning now from this exhibition of unlimited resources of power to the relatively insignificant use that is made of them, the disparity between the two will seem almost inexplicable. It at once calls to mind the familiar spectacle of water powers abandoned for steam, and the erection of steam plants on sites of unexceptional water powers—a spectacle so common, in fact, that the attention of the most casual and disinterested observer is constantly attracted to it.

The explanation does not lie entirely in the obvious advantages of cheap fuel and the great practical convenience of steam. It is mainly to be found in the irregularity of water power arising from total lack of constancy in the flow of streams. In this one defect of plan nature has practically nullified the vast benefits which her free water power might otherwise confer upon mankind. In a recent report the author of the present paper thus refers to this subject:

"In no other portion of her works has Nature left so much to be done by the engineer to supplement her deficiencies as in the modification of the natural flow of her stream, for in no other respect are her works so ill adapted to the uses of man. The ideal stream would be one in which the flow should be uniform from one year's end to the other, or, if not uniform, varying directly with the magnitude of the uses to which it is put. Nature presents no perfect example of this ideal, and in only one important instance does she closely approach it. The flow of her streams is subject to the most radical variations, the maximum discharge of the larger ones often being as much as thirty times the minimum, while in the smaller streams the ratio is much greater. These irregularities of flow have no economical relation to commercial or other uses of the stream. In the autumn season, when crops are being moved and the demand for transportation facilities is at a maximum, the streams are in their lowest stage, and their navigation subject to the most serious interruption of the entire year. In regions dependent upon the flow of the streams for agricultural development, high water occurs at such times and in such magnitude that it cannot nearly all be used. The result is that millions of acres of fertile land remain in a desert condition where they might be made productive if only the waste water could be utilized. In fact, all enterprises dependent upon the use of running water are liable to interruptions and suspension for indefinite and irregular periods, and the benefits which come from uniform and continuous use are not to be expected from them."

And in passing from the evil to its remedy the report says:

"Inasmuch as human agency can exercise no appreciable influence over those climatic conditions upon which variations of stream flow depend, such as the precipitation of moisture and the melting of snow, it is evident that the ultimate causes of the evil conditions just described must ever elude the efforts of man to control them. The sources of the streams are clearly destined to remain as variable in the future as in the past. The only possible method by which uniformity of flow can be secured must therefore be by storing the surplus waters in seasons of flood and releasing them in seasons of drought."

The necessity of a more complete utilization of water power, and consequently of a more extensive conservation of the waste flow of streams, will increase with the growth of business, the density of population, and with the possible diminution of other available sources of power, such as cheap coal, wood, natural gas, etc. In nearly all sections the storage of water for agricultural uses will increase in importance, for farmers will learn that irrigation, if not a necessity in humid countries as in arid, is still of great utility. The whole course of industrial development, in fact, will be to increase the necessity of conserving and utilizing the waste flow of streams.

The conservation of stream flow upon vast and comprehensive scale, being thus apparently a necessary feature of the development which this country is to undergo, the question of the best agency for its accomplishment may properly be taken up. It is manifest at the outset that the considerations which exclude the government from the construction of a dam for a particular individual do not apply to a great reservoir whose influence extends beyond the field of enterprise of any individual or association of individuals. Take, for example, the case of a proposed reservoir recently examined by the present writer on the South Platte River, above the city of Denver. The water from this reservoir, if constructed, might be used in supplying the city of Denver and other towns. It might turn many factories in that busy centre of industry. In descending to the plains it would be run out upon the lands and used in irrigation. Portions returning in seepage would be utilized again, and thus the uses of this stored water would reach many individuals, numerous and diversified industries, widely separated communities and even different States. In times of flood the functions of the reservoir just considered would be reversed, its gates would be closed, and it would reduce the flood in the stream below by the total amount of the run-off above the site of the dam. In the case of other reservoirs the navigation of rivers and canals might be benefited by them. There is probably no other class of works whose benefits affect such a diversity of interests, or which can so strictly be said to relate to the general welfare. It is, perhaps, for this reason that streams of all sizes are considered quasi-public property, at least to the extent that no individual may deprive his neighbor of his rightful share in their use. Of navigable streams this is particularly true, and their entire regulation and control rest with the State.

When a reservoir of this magnitude is built, it cannot be of a private character, and any attempt to make it so will be inconsistent with the public good. Indeed, there is an element of injustice in requiring that such extensive works shall be built, if at all, by private parties. An individual or a company undertakes a work for the revenue which it is expected to yield. It is necessary that they have such control over the results of their work that they may force the beneficiaries therof to pay them tribute. But no private party can control the benefits that flow from a great reservoir. In the example just considered it might be possible to control a single source of profit, but hardly more, and a vast number of people would be benefited by the work without contributing anything to the cost of it. Only the government can be sure of reaping the full benefit of such a work, for it does not seek its return in a direct and tangible revenue, but in the resulting increase of national wealth. If a private company should find in a single source of benefits a sufficient revenue to justify construction of the work, this would only show how much more profitable it would be to the government if constructed as a public work. In this one consideration lies the conclusive answer to the argument often adduced that no reservoir should be built unless it will yield a profitable return upon its cost; and if it will do this, private capital will undertake the work, and there will be no need of government aid.

The magnitude and character of these works, furthermore, are such that no less powerful agency than the government can properly handle them. The occurrence of good reservoir sites is not so common, but that, when found, they should be improved to their utmost capacity. The resources of private parties rarely permit this, and if they did the objects of their enterprise probably never would. No individual or company can be expected to go to an enormous outlay solely from considerations of public good. They will build their reservoir only so large as will answer the ends they have in view. Economy of means may probably lead to inferior work, and almost invariably the result will be less than the site is capable of. But being once in possession of the ground, and having occupied it with an inferior work, the difficulties in the way of proper improvement are greatly enhanced. Clearly the proper execution of such work can only be accomplished by an agency which has the resources to construct it on the most comprehensive plan and in the best way, and is not compelled so to plan its investment that it shall be revenue-yielding from the start or very soon thereafter. Bearing upon this point are the following remarks from the report already quoted:

"It should be remembered that the works herein proposed are of the most substantial and enduring character. River improvements, fortifications, public buildings and the like are liable to destruction and decay, but a mass of earth or masonry properly placed in a great dam becomes as lasting as the hills which inclose it. Constructed to endure for all time, the benefits which flow from these works will be perpetual. It is not for the government, therefore, with its lease of life altogether beyond that of an individual or company, to limit its expense as an individual would to the certainty of entire reimbursement within a few years. When it improves a site, it should improve it once for all to its full capacity with the most thorough and substantial workmanship, making the work final and complete, being certain that the heavy first expense will be ultimate economy."

Pertinent to this question of the conservation of stream flow is that of the preservation of forests. There exists in all civilized countries a general belief in the necessity of maintaining forest growths; and, while this preservation is urged upon citizens so far as their own property is concerned, it is generally regarded as a legitimamte duty of government to promote this cause by direct appropriation. Now, one of the arguments set forth in support of government preservation of forests is that forests tend to conserve and regulate the flow of streams. In some portions of this country, as in the arid regions, where the forests are of little value for timber, the conservation of stream flow is the principal argument. If, then, the government is justified in preserving and extending forests on account of the indirect effect which they have in conserving the flow of streams, how much more ought it to be justified in expending money upon works which will conserve it far more directly and effectually. Whatever may be said of the effects of forests, they certainly do not prevent spring floods, and yet it is precisely this waste that it is important to save.

Reference has already been made to the fact that the conservation of stream flow is a matter which in many cases could not be entrusted to private agencies consistently with the general welfare. It is desired to emphasize this point. The waters of our streams should remain absolutely free. No private party should be permitted to appropriate them to himself and sell their use to others. One need but study the history of irrigation in the arid regions of this country to realize how evil a thing it is to make a merchantable commodity of water. The streams should be free, and in order that they may be so, all works intended to conserve and regulate their flow should be built by the people, and the waters so conserved should be as free as those of the natural stream. This result cannot be realized, if the conservation of stream flow is left to private agencies, for the sale of water, in some form or other, is indispensable to the success of their investment.

If the foregoing arguments are sound, it follows that the conservation of stream flow is eminently a public duty. It may be added that it is one which may be carried out with less liability to abuse than almost any other form of public work. The data upon which the cost of such works, and the benefits to be derived from them, depend, are so determinate that no ill-advised or injudicious project need ever be entered upon.

Industrial Combination: Its Failures and Successes.

By Arthur T. Hadley.

Twenty years ago industrial combination seemed like a new thing. It is true that there had been for two hundred years previous a gradual concentration of capital. Home industry had given place to factory industry, small factories had been displaced by larger ones. The sailing vessel had been superseded by the steamship, the stage-coach by the railroad. But though the size of the units increased, each remained a unit. It is only in recent years that we have become accustomed to those larger aggregations of capital which are stimulated not so much by the need of organizing the physical operations of manufacture as by the need of systematizing the commercial operations of purchase and sale.

Almost every outside observer was at first disposed to condemn the formation of these monopolies as something wholly bad. Down to the present day this view is shared by the majority of people in the United States. It has found expression in the pooling clause of the Interstate Commerce Act and yet more recently in the anti-trust acts passed by the various States and by the National Congress itself. Those who hold this view say that competition is the life of trade; that it is favored, and justly favored, by the courts; that any attempt to do away with competition is almost certain to be adverse to the public interest, and that where such an attempt is successful we should not merely refuse it legal sanction but should prohibit it by the severest penalties.

There were a few publicists and political economists who held a somewhat different view, who agreed with the bulk of the people in thinking that industrial monopoly was an evil, but who, nevertheless, held that it was an evil which could be left to work its own cure. Granting that the monopolists might for a time exact high prices, these writers contended that such prices would attract new capital into the business. This would create a renewed intensity of competition. It would benefit the consumers by driving prices down; it would punish the monopoly by destroying the sources of profit on which it had relied. Even though the fluctuation of prices was an evil, the stimulus to productive activity and to new invention was, in the opinion of these writers, a public good which outweighed any incidental harm involved in the process. So far from seeking to enact laws against pools, they would have us rely on the economic forces of modern business life as a surer and safer remedy.

There was a third group of writers, at first very much smaller than either of the others, who regarded the tendency toward large industrial combinations as in itself a good thing. These writers emphasized the necessity of a well-planned and well-ordered system of production as against the chaotic conditions of modern business. They urged that combinations of producers had always meant economy in production, and that in similar fashion combinations of dealers would mean economy in distribution. They held that these advantages were so great that neither the laws of the commonwealth nor the laws of economics were powerful enough to resist the tendency toward monopoly. They showed that trade combinations were not peculiar to America, but were at least equally characteristic of England and of Germany, and that in not a few instances international combinations had been formed, like the steel-rail pool or the copper syndicate, which aimed to regulate the trade of a large part of the civilized world in one central authority. They argued that this was but an incident in the world's economic progress. Whither it was to lead us they were not wholly clear. Some thought that we had reached a new stage in the evolution of the power and influence of the capitalist. Others held that it was but a stepping-stone toward socialism, and that as each combination became complete it must ultimately fall into the administration of the State.

But as time has gone on we have come to see that neither of these three views is wholly justified. The champion of industrial combination can indeed point to the fact that the number of combinations on a large scale is increasing. A recent German book on the subject has cited many hundreds of instances. As far as this evidence goes it would indicate that industrial evolution was tending to favor monopoly. But if we look a little farther into the subject we find that the majority of such combinations are unsuccessful; that for one monopoly which is managed with beneficent foresight there are half a dozen which are managed shortsightedly; that for one which lays the foundations of permanent success there are a great many which end in monumental failure. We have come to see that combination is neither good in itself nor bad in itself; but, like most other human agencies, good if well managed, and bad if badly managed. There is to-day an increasing number of economists who hold a view which combines the second and third of those already described; who believe that if combinations are shortsightedly managed they will end in failure, and that this failure will protect the consumers from the permanent evils which would otherwise ensue; that if they are well managed they will lay the foundations of success for themselves and of perpetuation for their methods of public service. Those who hold this view would reduce legislation on the subject to a minimum, not because combinations are sure to be good, nor because they are sure to fail, but because they are sure to do either the one or the other.

Let us look back at the history of industrial monopolies and see what have been the conditions that have characterized the successful ones. The formation of a monopoly, complete or approximate, is apparently easiest where we are dealing with some natural product whose sources of supply are limited, like copper or iron, oil or coal. The history of the attempts to monopolize these staples goes back to a very early period. Our anthracite coal combinations a little more than twenty years ago were perhaps the first that attracted widespread public notice; but they were by no means the first to exist. On the contrary, there is complete evidence of similar combinations among the English coal-mine owners, going back to the beginning of the present century. As for combinations in the iron trade, we have a record of one which was established more than two thousand years ago, for Aristotle tells us that "There was a man in Syracuse, in the days of Dionysius the Tyrant, who bought all the iron in the island of Sicily and was able to sell it at such prices as he pleased, and thereby make large profits. When Dionysius the Tyrant heard of this he was pleased with the ingenuity of the man, and told him that he might keep his money, but had better leave Syracuse," which shows that anti-trust laws were about as old as trusts themselves.

But if we examine into the history of these "natural" monopolies we shall find that though apparently easy to perpetuate, they are not really so, and that even when temporarily successful they have generally ended in failure. The dissolution of a coal or iron combination is as frequent an incident as its establishment. Even the strongest of all these monopolies, the French copper syndicate of 1888-89, was no exception to the general rule. This syndicate seemed to have every advantage in its favor. Copper was a necessity of modern business, and with the increasing use of electrical appliances, a growing necessity. The good copper mines were not too numerous to be brought under a single control; and as a matter of fact the syndicate had at one period contracts with practically all the good sources of copper supply, which would have enabled it to regulate their output. The capital invested in the undertaking was enormous, and was contributed by some of the strongest financial houses in the world. Yet with all these advantages on its side the syndicate failed, and failed so disastrously as to drag to the brink of ruin houses whose names had been for nearly a century synonyms for financial strength. It failed because it tried to raise the price of copper. Controlling the supply as it did, its managers thought that it could control the market. They did not foresee how much less was the demand for copper at 14 cents a pound than it had been at 9 cents. They did not foresee the inventions and devices which would be adopted for economizing the use of copper and lessening its consumption. The syndicate was thus left with a large and increasing supply of unsold copper on its hands; a perpetual menace to the stability of the market, a growing burden on the financial resources of those who held it, which finally proved too heavy even for the strongest shoulders.

Combinations of large plants engaged in manufacturing or transportation have apparently had less chance of success. Their monopoly was a more precarious one, because it was in the power of others to enter the market and duplicate their factories or their railroads. Yet the proportion of successful monopolies in these lines has been much greater than among the monopolies of natural products. That difficulty which seemed like a menace to their stability has sometimes proved their salvation, for it has compelled them to seek their success by reducing expenses rather than by raising prices. In such combinations the control of the market, which they were able to exercise by an increase or a limitation of the output, has been an incidental rather than a primary object. The great gain has been in economy of production. In the first place they are able to avoid unnecessary duplication of plant, and thus keep their machinery more fully occupied. In the second place they can avoid great variations in the amount of work done in different seasons—variations which are sure to take place if each man extends his production for himself on the basis of the past season's experience, without noticing or knowing that a dozen other people are doing the same. Finally they are able to save the multiplication of selling agencies and the unnecessary expense of advertising, which is largely a result of duplication of plant and irregularity of output. Not that I would condemn advertising as some condemn it, as a wholly unnecessary expense, for it is of great value in informing the public of good articles to be obtained. It makes a market for goods by letting people know how their wants can be best supplied. But three-quarters of the competitive advertising is of a totally different character. It is an endeavor by the use of drums and trumpets to lead the public to buy the goods of X rather than the equally meritorious product of Y, and in the long run the public must pay for the drums and trumpets as well as for the goods.

All these are evils which affect the public; and an industrial combination, by avoiding these expenses, is a means of public economy no less than of private gain. It enables people to get their goods with less actual labor cost, because the different machines are utilized more advantageously; because it avoids those alternations of plenty and scarcity, with attendant fluctuations in price, which are an evil to consumers as well as producers; and because it frees the public from certain quite unnecessary elements of incidental expense. That most successful combination of all, the Standard Oil Company, has owed its success to its progressive methods. It has not raised the price of oil, but has lowered it. Whether the price of oil has fallen faster or slower than it would have done under free competition is a matter on which there is room for difference of opinion; but there is no question that it has fallen, and fallen greatly, and that the large profits of the company have been made, not by raising the prices, but by limiting expenses. It is not as an owner of oil wells, limiting the source of supply, that it has made its history, but as an owner of plant for transporting and refining oil, which it has managed with a high degree of efficiency and economy.

There is no time to go into the history of a large number of combinations and point out in each individual case the causes which have contributed to their success or failure. It is enough to say that the failures have in general been caused by a one-sided effort to raise prices, the successes by laying stress on the reduction of expense. The real evils which have developed and against which the public needs to guard itself are to be found in the dealings of such combinations with their competitors. The history of the Standard Oil Company in this respect has been subjected to widespread and oftentimes merited criticism. Without denying or palliating these evils, it is enough to say that the real danger could be met by a stricter interpretation of the laws concerning conspiracy better than by more sweeping laws intended to protect the public against an imaginary danger, which end by protecting nobody against anything at all.

There is another aspect of industrial combination which is coming to have at present no less importance in the public economy of the country than combination of capital. I refer to combinations of labor. Much is to be gained by studying the two things in connection with one another. For trades unions have the same reasons for existence as combinations of capital. They have the same liability to errors of policy. Their success or their failure is in the same way dependent upon the spirit in which they deal with the public.

The pressure for the formation of trades unions derives its force partly from the irresponsible competition of laborers with a lower standard of living, and partly from the existence of large combinations of capital, which seem to have a position of advantage in dealing with the isolated laborer. The extent of this advantage of the capitalist is very much overrated by the

workman, for he seldom understands the full scope of the economic forces which compel the capitalist to pay him approximately the value of his product, while he does feel to the fullest extent the effect of all those forces which are driving the price of that product downward. But after making due allowance for this exaggeration, the position of the skilled laborer is oftentimes a precarious one. The capital that he has invested in his education is like the capital which his employer has invested in his factory. The remuneration for each of these capitals may be destroyed by a bankrupt competitor; and there is this difference between the two cases, that the manufacturer is competing at the risk of his profits, but the laborer at the risk of his standard of life.

But however powerful the reasons for organization, it is probably true of laborers, as well as capitalists, that the great majority of combinations do more harm than good. Why? Because, when once formed, they attempt to raise the price of labor rather than to increase its efficiency. The trades unionist, of the older style at any rate, treats labor as the copper syndicate treated copper—a thing of which he has control so that he can at once limit the supply and raise the price. Sometimes he seeks to do this by rules limiting speed of work, sometimes by legislation for shorter hours, sometimes by restricting the number of persons allowed to enter the trade and putting in force against outsiders measures more severe and obviously illegal than any used by rings of capitalists. The result is the same in the one case as in the other. Diminished efficiency and artificially enhanced price mean diminished demand. Producers outside of the union, if shut out from one avenue of competition, find some other means of entering the market. The more powerful the labor combination the more widespread and extensive is the failure when it does come. Just at the moment when English advocates of organized labor are proclaiming the advent of industrial democracy there are signs of a falling off of English power in the competitive markets of the world, a fall which must lead either to the permanent diminution of English wages or to the modification of English trades-union methods. The great engineering strike of a year ago is but the first instance of this inexorable alternative.

If, on the other hand, combinations of labor, like combinations of capital, can really increase the efficiency of the workers, if they can make rules which do not limit output so much as they guarantee quality, the conditions are all in their favor. With the continuity of modern industrial operations the advantage of dealing with large and responsible bodies of men rather than with irresponsible individuals is very great indeed. Like the combination of capital, the combination of labor can make provision for regularity of employment more fully than can the individual laborer acting as a free lance. Like the organizations of capital, the labor organizations merit neither indiscriminate condemnation nor indiscriminate praise. It is years since we have tred to legislate against them as we legislate against pools and trusts, but the public is still divided into two camps, one of which regards trades unions as an incident, and a predominantly good incident, in the process of industrial evolution, the other of which regards trades unions as a serious evil, only palliated by its essentially suicidal tendency. But we may have confidence that a policy of toleration, if consistently pursued, will allow the elimination of the evil and the perpetuation of the good. In this, as in other matters, the growth of a more intelligent study of history, as an evolution may help us to a more catholic judgment, may lead us, with Browning's Paracelsus,

"To see a good in evil, and a hope
In ill-success; to sympathize, be proud
Of their half-reasons, faint aspirings, dim
Struggles for truth, their poorest fallacies,
Their prejudice and cares and doubts and fears."

A good deal of money is spent occasionally by mill managers in experimenting with different sizes and kinds of coal, in order to see which gives the best result under the mill boilers. Sometimes it will be found cheaper to have the boilers set to burn that kind of coal which can be put down at the mill for the least cost.

The Conservation of Water Power.

By L. F. Vernon-Harcourt, M. A. M., Inst. C. E., London.

Water which is drawn up into the air as vapor by the heat of the sun, when descending again as rain to the earth, furnishes a source of power liberally provided by nature, proportionate to the elevation of the surface of the ground upon which it falls, and from which it flows off under the action of gravity, to return again to the ocean from which most of it is originally derived. Mills for grinding corn, for making paper, and for other manufacturing industries, have for a long period been situated on rivers and streams in England and on the Continent of Europe, where the power for working the machinery is very cheaply obtained from the fall of the water, by the intervention of watersheds or turbines.

The amount of the water power depends upon the fall obtainable and the volume of the supply, and also upon a fair regularity of flow. The fall is greatest in the upper portions of the course of a main river and of its tributaries; but the discharge is much smaller than in the lower parts, and is subject to greater fluctuations, according to the season of the year and the rainfall.

On the other hand, in the lower portions of rivers, where the volume of water is much larger and the flow more uniform, the available fall is comparatively small; while the obstruction in the channel presented by a mill dam, is liable to be detrimental to navigation, and to augment the injurious inundations in flood tide over the adjacent low-lying lands above the dam. Accordingly, mills have been more frequently established upon the higher parts of rivers, where a good fall and complete control of the discharge enables the water power to be more effectually utilized, with comparatively little injury to other riparian interests.

The great reduction, however, in the discharge of streams in the upper parts of a river valley in hot dry weather may cause serious interruptions in the working of mills dependent on their flow, and in very hot dry years may prove a source of considerable anxiety to populations in towns lower down, relying upon these streams for their water supply; while very high floods in cold wet seasons may impede the working of the mills. Consequently, a regulation of the discharge of the upper portions of rivers, in order to render their flow throughout the year more uniform, is almost as important in the interests of the working of water mills as for purposes of the water supply of towns, or the mitigation of devastating floods.

Moreover, as the natural sources of water power are limited in extent, it is important that in proportion as the readily available resources are monopolized by the extension of industrial undertakings the waste of power from the excessive discharge during floods should be arrested, and that the excess of water which flows away towards the sea during rainy periods not only uselessly, but even harmfully to riparian interests, should be reserved for future advantageous employment.

REPLANTING OF TREES ON MOUNTAIN SLOPES

The discharge of rivers and streams is most irregular in the upper part of a river basin, especially where the strata are impermeable and the slope of the valley considerable, for the rain cannot sink into an impermeable soil, and, with a steep slope, flows rapidly down to the stream or river, draining the valley, which consequently is torrential in its character, rising rapidly and to a considerable height after a heavy rainfall, and falling again quickly after the rain has ceased. This torrential characteristic is most marked where the mountainous slopes of the valley have been rendered bare by the extensive cutting down of the forests, with which nature has generally clothed them, for the sake of the timber, and by the removal of the grass by the too frequent grazing of greater flocks of sheep and goats than the sparse mountain herbage is able to provide for.

This improvident conduct, moreover, for the sake of a temporary gain, does not merely remove the vegetation which checks the flow of the rainfall off the ground, but by greatly promoting the rapid descent of the water causes it to wash away the soil on which the renewal of the vegetation depends, and, by the carrying of the débris of the mountain slopes into the river bed, intensifies the action of the floods and the injuries which they produce. The clearing of the forests, and the diminution of vegetation on the mountain slopes of the High Alps in France, so augmented the destructive efforts of the torrents descending from them, that laws had to be passed, in 1860 and 1864, for the replanting of the slopes with trees, and the encouragement of the growth of vegetation and its protection from undue cropping; and these measures have been attended with remarkably beneficial results.

Trees, shrubs, and grass have, indeed, a very marked influence in moderating and regulating the flow of rivers draining an impermeable stratum in a mountainous district. During periods of heavy rainfall vegetation restrains the water from flowing rapidly down into the river draining the valley, and thus reduces the height of the flood and the impetuosity of the current, and tends to prevent the floods from the upper river and tributaries descending into the lower river before the floods from the rainfall in the lower part of the basin are beginning to subside.

Moreover, by delaying the arrival of the water into the river resulting from the rainfall in the upper part of the basin, it spreads the flood discharge over a larger period, thereby not only reducing the height and destructive influence of the flood, but also regulating the discharge. The beneficial influence, also, of forests and vegetation is not confined to the period of floods; for when evaporation is very active in hot weather, the covering of leaves and grass greatly reduces the evaporation, and thus considerably increases the proportion of rainfall which eventually reaches the river, thereby augmenting the discharge of the river at a period when it is liable to fall to a minimum.

In fact, trees and vegetation, under these conditions, store up water under their shelter, which would otherwise be lost by evaporation, and thus assist the conservation of water power at a period when it is liable to be very low. The protection, therefore, of existing forests, and the affecting of, and encouraging the growth of vegetation on denuded slopes, fulfill a very important function in the conservation of water power; for they prevent the further denudation of the mountain slopes, and the consequent aggravation of the destructive effects of floods and the irregularities of discharge; they reduce the maximum discharge, and help to regulate the flow in flood tide, and they increase the discharge at the low stage of the river.

Some observations carried out in France indicate that the existence of a forest tends to increase the rainfall, for it was found that during a period of eleven months in 1874 the rainfall over the forest of Halatte was 1½ inches more than on the adjacent open country; but this, which should be tested by similar observations in other localities, is a slight increase compared with the augmentation of the effective rainfall by the reduction in evaporation resulting from the protection of the trees far more than counterbalancing the loss of rainfall actually reaching the ground on account of the shelter afforded by the foliage.

RESERVOIRS FOR THE CONSERVATION OF WATER.

Numerous reservoirs have been constructed in Great Britain and the Continent of Europe for storing up the water of rivers and streams, chiefly for the water supply of towns, and also for supplying canals with water; though some reservoirs in Spain have been provided for irrigating the land. Several irrigation reservoirs have been constructed in India, of which the Geriyar reservoir, for irrigating the Madura district in the Madras Presidency, is one of the most interesting, as being the most recent and on account of the high rubble masonry and concrete dam by which it is enclosed.

In England the sources of water are so limited, in comparison with the density and rapid increase of the population, that all recent reservoirs have been constructed for the water supply of towns; and the use of water power is restricted to those water courses, mostly in the upper part of river basins, over which rights have generally been acquired a long time ago.

In France reservoirs have been recently formed for the supply of water to the enlarged existing canals and the new canals carried out for the extension of inland navigation within the last twenty years, as well as for the more ordinary purpose of water supply to towns. In the early part of last century masonry dams were erected at Pinay and La Roche in the Upper Loire Valley, to store up for a time a portion of the flood waters, and thus reduce the height of the floods of the Loire lower down; and the well-known Furens masonry dam, retaining a head of water of 164 feet, was erected in 1861-66 across a narrow gorge of the valley of the river Furens, a tributary of the Loire, a few miles above St. Etienne, with the object in the first instance of protecting the town below from inundation by temporarily storing up a portion of the excessive flood discharge.

The water, however, stored up by this Furens reservoir, as well as by another formed by a lower masonry dam higher up the valley, has been utilized by supplying the town of St. Etienne with water; so that these reservoirs serve the double purpose of providing a supply of pure water and also of mitigating the torrential floods of the Furens. Moreover, these reservoirs have to serve a third object, like all other reservoirs placed across rivers on which water rights exist, namely to supply water regularly to the Furens when its discharge falls below a certain amount in the dry season, so as to maintain an adequate flow for the mills using the water power of the current between the reservoirs and St. Etienne, so that the mills may not be stopped by lack of water in dry weather, as was the case previously to the erection of the dams.

Reservoirs, indeed, to whatever purpose the water power stored up by them may be applied, are very valuable regulators of the flow of the rivers across which the dams forming them are placed; for the reservoirs collect some of the superabundant discharge in flood tide, and thereby reduce the height of the floods in the valley below, and mitigate their devastating effects; and they also restore some of the stored-up flood water to the river during dry weather when its flow, especially in the case of torrential streams, is very liable to be inadequate to serve the industrial purposes to which its water power is applied.

Accordingly, reservoirs constructed in torrential river valleys, unlike some engineering works, are wholly beneficial in their results; for they not only serve to preserve water which would otherwise flow away to waste, to be utilized with profit by those who carry out the works; but they also benefit the riparian interests in the valley below, by reducing the discharge of the river when liable to be harmful, and increasing the flow when it becomes too small. It is therefore evident that the construction of reservoirs, for whatever purpose, should receive every encouragement; while it is only in thickly populated countries, where the supply of water is liable to become deficient, that catchment areas must be specially reserved for water supply to towns.

Suitable sites for reservoirs are valleys formed of impermeable strata devoid of important fissures, and where a dam across a fairly narrow gorge will serve to retain a large volume of water in a wider valley above. The extent of the catchment area drained by the river passing through the valley must be measured, and the rainfall at several stations within the area recorded for as long a period as practicable, and the effective rainfall calculated as approximately as possible, so as to make certain as to the volume of water available for filling the reservoir.

The reservoir, moreover, should contain a sufficient volume of water to afford the full supply of water for the purpose for which it is constructed, and also the requisite compensation water to the river below, for as many days in succession as the period over which the longest estimated drought might extend without any rainfall sufficient to replenish the reservoir, which depends on the special climatic conditions and periods of rainfall of the catchment area.

Two distinct forms of reservoir dams are employed according to the conditions of the site, namely, earthen and masonry or concrete dams. An earthen dam is ordinarily used where the height of the dam is moderate, and suitable materials for its construction are available in the vicinity; and this form of dam must be employed where a foundation of solid rock cannot be obtained. The form of an earthen dam is that of an enbankment with flat slopes on each side, and a central water-tight wall of padded clay, carried down into an impermeable stratum along the bottom of the valley and up each side, so as to thoroughly secure the dam against any infiltration of water from the reservoir through or under the dam.

Looser material is preferably used on each side of the central puddle wall, as compact tenacious material such as clay would be liable to crack, in hot dry weather, on the outer slope, and also on the inner slope when the reservoir becomes low, leading to disintegration and slips during wet weather and frosts. The inner slope toward the reservoir is usually made 3 to 1; and the outer slope, on the lower side, is given the slope requisite to insure the stability of the material used, and rarely less than 2 to 1. The mass of the dam has to be carefully carried up gradually in thin, horizontal layers well rolled. The inner slope has to be protected from erosion by wave action in the reservoir, by a coating of stone pitching or concrete.

The culvert for carrying away the supply of water from the reservoir should be carried in tunnel through the solid ground at one side of the valley, beyond the end of the dam, as the old practice of carrying the supply culvert under the centre of the dam has occasionally, owing to the fracture of the culvert by unequal settlement and consequent infiltration of water, resulted in the destruction of the dam, accompanied sometimes by widespread devastation produced by the water from the reservoir rushing as a torrent down the valley.

If the culvert must, owing to special circumstances, be formed in the dam, the valves controlling the supply of water should be placed in a valve tower erected at the inlet to the culvert in the reservoir. A bye pass, or waste wier, has to be provided at a suitable place at the side beyond the dam, made of sufficient width to carry off, into a suitable paved channel below, the whole of any sudden, exceptional flood which the river might discharge into the reservoir when full, without raising the water in the reservoir high enough to be in any danger of overtopping the dam.

Masonry dams are preferable to earthen dams when the height exceeds about 80 feet, though earthen dams 100 feet high have been successfully constructed; but a solid rock foundation is essential for a masonry dam for any settlement would necessarily produce cracks in the masonry or concrete and lead to the destruction of the dam. A masonry dam has to be constructed of such a section that the lines of resultant pressures, with the reservoir empty and full, may not pass outside the middle third of the dam, and thus avoid tension on either face, which masonry and mortar are not suited for supporting to any content without injury.

The line of resultant pressures with the reservoir empty, is the locus of the centres of gravity of successive sections of the dam from the top downward; and the line of resultant pressures with the reservoir full, is the locus of the components of the vertical weight of the dam acting at the centre of gravity of successive sections, and the horizontal pressure due to the weight of the water in the reservoir above the section considered. These pressures distributed over the whole width of the dam, must not in any part exceed the amount which the masonry and mortar or concrete can readily sustain without the slightest injury on the given area.

The masonry of the dam must be carried into the solid rock on each side of the valley, as well as along the bottom, so as to provide against any chance of infiltration from the reservoir at the junction of the dam with the rock. The masonry or concrete must be built as compactly and imperviously as possible, so as to prevent the water of the reservoir, under its great head near the base of the dam, finding its way through the joints in the stones, and gradually washing away some of the lime out of the mortar, as has occurred to a very noted extent in the Gileppe dam near Verviers in Belgium, where the lower outer face of the dam is coated with the incrustations of the lime removed from the joints by percolation of the water through the wide dam.

Besides making the mass of the dam as water-tight as possible by very careful workmanship, it is advisable to line the inner face of a high masonry dam with an impervious coating, so as to secure the dam as far as possible from any entrance of water into its joints. Though the supply culvert has occasionally been formed in the central part of a masonry dam without any injury, as, for instance in the case of the Villar dam near Madrid, it is preferable to carry the culvert in tunnel through the solid rock on one side of the valley.

The waste wier in a masonry dam may

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be formed on the top of the dam, provided the outer face is so shaped as to prevent undermining at the toe by the fall of the water from the overflow of the reservoir down the dam, an example of which arrangement is furnished by the Vyrnwy dam in Wales for the water supply of Liverpool, where the road across the dam is carried on arches, through which the surplus water flows over the dam into the river below. Some cross-sections of the most notable masonry dams are given, drawn to the same scale, in the article "Water Supply" in the Encyclopædia Britannica.

Occasionally, instead of forming a completely artificial reservoir, it is possible to utilize an existing lake by raising its water level by a dam of moderate height across its outlet. This plan has the advantage that even the bottom layers of the newly impanded water have a considerable area, equivalent to the area of the surface of the original lake, instead of the small extent of the bottom of an artificial reservoir in a valley; and therefore a moderate raising of the water level impounds a very large volume. A notable recent application of this system is the raising of Thirlmore Lake in Cumberland 50 feet by a dam across its outlet, whereby an eventual additional water supply of 50,000,000 gallons per day has been secured for Manchester; and the similar rasing of an existing lake in Wales has been proposed for providing a large additional supply of the purest water for London.

The Value of Statistics.

By Carroll D. Wright.

Napoleon's maxim that "statistics mean the keeping of an exact account of a nation's affairs, without which account there is no safety," finds abundant and practical application in the history and development of the United States. The statistical method is the historical and comparative method of modern times. In its use the results have been in proportion to the methods employed and the civilization of the people. Enumerations of population have taken place at irregular periods from early times, but the first attempt at a comprehensive, precise and regular statistical system was during the eighteenth century, which may be said to have witnessed the birth of official statistics, and, like every other branch of human activity, the science has experienced a far more rapid and extensive development in the present century than in the preceding. With the steady progress of most civilized states during the last two generations toward more liberal political institutions, in which it is held that healthy legislation can flow only from an exact knowledge of the condition and wants of the people, public statistics, as the most reliable gauge of the true interests of both governments and governed, have become more and more the basis of the enactment and administration of laws. And again, the greater concern of man in man, growing out of the general advancement of society, has naturally tended to increase the number of those who privately devote themselves to the study of statstics and to the building up of the scientific method, or, if you please, the science of statistics, to the commanding proportions which it has now reached.

Social science, as I understand it, comprehends the analysis and classification of the facts relating to the various conditions which surround the human race, and its chief object is to spread the knowledge resulting from investigation, to the end that the people themselves may better appreciate and understand their own conditions, and by their increased intelligence aid in the amelioration of unfavorable features and the eradication of positive evils. As an instrumentality of social science, statistics consist of a collection of facts relating to a part or the whole of a country or people, or of facts concerning classes of individuals or interests in different countries; especially those facts which illustrate the physical, social, moral, intellectual, political, industrial and economical condition or changes of condition, and which admit of numerical statement. Statistics, therefore, is that department of political science which classifies, arranges and discusses general facts.

One of the most essential primary objects of statistics is to secure a simple, concrete statement of a mass of facts, the essence of which could not otherwise be expressed except through long and tedious descriptive language. Social science, then, with its important instrumentality, the statistical method, applies the maxim "Know thyself" to the people, and endeavors to obtain and propagate knowledge. It is to the same end that our governments, both State and Federal, have established various boards and bureaus, to which are committed important interests, not only within the region of actual investigation, but in the care and protection of special classes; and all these offices, although their work is often crude and may be at times unreliable and without central uniformity in system, are doing a great work for humanity and deserve well of the people at large. It was in this spirit, and with an ambition to place the people of the United States not only in the front rank, but in the van of the world's statistical work, that the founders of the nation instituted the natonal census, by providing in the Constitution adopted in 1789 for a regular, systematic enumeration, which has been carried on decennially since 1790, the date of the first census. There are three periods to the American census: The colonial, the continental and the constitutional, or the present. During the first period the British Board of Trade played an important part in American affairs, and it often attempted an enumeration of the people of the colonies, but the census had not then assumed scientific form and definiteness in Europe, and, as would be expected, the results were very imperfect and excited great fear on the part of the public. This has been the case whenever enumerations have been attempted, from the time of King David to the present. They are accompanied with superstition, fears as to taxation and various other obstacles to a correct account. All these things attended the colonial times; but even without such obstacles success could not have been attained in the colonial period, for the mother country took her first census in 1801, following that of the United States.

During the continental period, although resolutions had been introduced in Congress, no general enumeration of the population was secured. Various estimates and computations were made from time to time, but they came no nearer accuracy than those made in the colonial period. It had, however, become clearly settled that there never could be a complete enumeration until the work was done by a central directing authority. It was thus left to the Constitution to give us first an enumeration of population, and afterward what may be called a national census, and the framers of the Constitution, after long deliberation, matured the well-known phrase, "Representatives and direct taxes shall be apportioned among the several States which may be included within this Union, according to their respective numbers," etc. It was this fundamental provision which resulted in the enumeration of the population in 1790, and from this has grown our modern census, comprehending, instead of one simple schedule with six inquiries, many schedules, embracing several hundred inquiries, through which information is sought concerning the people, their conditions, wealth, industry, religion, employment, indebtedness and surroundings.

Our censuses have been the result of steady and uniform development till the ninth, when, under the direction of the late Gen. Francis A. Walker, there was secured one of the grandest contributions to statistical science of this or any other age. The succeeding censuses, the tenth and eleventh, are encyclopedic in their proportions, and disclose the facts of the people in almost every direction.

A distinguished French writer on statistics, Moreau de Jonnès, has pronounced a somewhat fulsome eulogium on the founders of the American government. He says:

"The United States presents in its history a phenomenon which has no parallel. It is that of a people who instituted the statistics of their country on the very day when they founded their government, and who regulated in the same instrument the census of the citizens, their civil and political rights and the destinies of the country.

* * * * *

"To obtain the statistics of population is, in the United States, a civil duty that appeared so important to the assembly over which Washington presided, and of which Madison, Livingston and Franklin were members, that it pronounced penalties against the inhabitant or the magistrate who neglected it."

So the Constitution contains the germ of our modern census. While, however, the germ of the census in all its modern proportions is found there, the men who framed the Constitution and who were first called upon to carry its provisions into effect, comprehended the necessity of immediately expanding the germ, and they at once set the pace for official inquiry which pace not only has not slackened during the present century, but has even been accelerated to a speed which has sometimes been criticised.

Historical research teaches that the science of statistics, of which census-taking is one of the practical applications, is of modern growth, but its progenitors are found in the earliest periods of history. It also teaches that the need of a positive knowledge of the social forces at play in communities of men appears to have been felt from the time when the human race first segregated into distinct social and political bodies; that statistical observaton must be coeval with the very organization of society and government; that enumerations of the people have almost always originated in military fiscal or political necessities for determining immediate practical ends; that to modern times belongs the conception and growth of statistical systems for the purpose of answering the thousands of questions of social and political science; that all ancient methods were crude and imperfect, and their results were as crude as the methods employed.

Out of the census has grown various other departments of statistical research, like the offices devoted to the gathering of commercial statistics, the statistics of births, deaths and marriages, of production, of wealth, of transportation—of every line of business in which the individual units of society can possibly engage.

With this general statement of the origin and development of American statistics, several questions arise as to the value of the results or, in fact, of the method itself. And, first, the question is asked, and very often: "What right has the Government to collect facts other than those absolutely essential for intelligent legislation and the proper administration of laws?" The answer is sufficient, to my mind. The education of the masses in the elementary facts of political and economic science is one of the great educational ends of the day. The whole effort of government, therefore, to put the people in the possession of facts concerning all their conditions in life, so far as the same may be subject to official inquiry, belongs to the educational work of the people. It is the mission of Government to secure that information which is essential for the proper understanding of industrial and social conditions. This work cannot be done by the schools, nor can it be done by individuals. It must be done, if at all, by the Government, and our Government finds its duty under the Constitution to put the public in possession of certain lines of information, for the Constitution provides that Congress shall have power to provide for the general welfare, the preamble making the declaration that the Constitution itself is ordained and established for the purpose, among other things, of promoting the general welfare and of securing the blessings of liberty. The general welfare and the blessings of liberty can neither be secured nor promoted without an intelligent understanding of all the conditions surrounding life, and this intelligent understanding can be secured only through the statistical method.

This may be a sufficient answer to society for the prosecution of statistical inquiries, but the individual may inquire how he is benefited by all the annoyance to which they are subjected. Business men, when approached by the enumerator or the agent of a statistical office, feel that in some way they are being subjected to an official impertinence. I must confess that I share this feeling when a circular comes to me asking for various facts which are supposed to be within my knowledge. It is the same feeling with which, when a youth, I found myself obliged to take account of stock in a country drug store. But the account of stock was a necessity to the proprietor, and the account of stock of a nation's affairs is just as necessary as the account for an individual establishment. The business use of statistics was splendidly shown in the earliest experience under the Federal Constitution. In studying the nature, the value and the extent of statistics in a business sense, one turns naturally to the efforts of the first Secretary of the Treasury, Alexander Hamilton. Hamilton knew the needs of the country, but he knew also the dearth of information. He knew that the necessities of the country could not be thoroughly understood and systems adopted for the development of industry without information relating to existing conditions. His associates, not only in the administrative but in the legislative branches of the Government, understood this also, and as these men constituted the first practical interpreters of the Constitution and of what was right and proper to do under it, their action becomes of vital importance when considering the value of the statistical method.

Our present Government went into effect March 4, 1789, and the second law passed by it was approved July 4 of the same year, with this significant preamble:

Whereas, It is necessary for the support of the Government, for the discharge of the debts of the United States, and for the encouragement and protection of manufactures, that duties be laid on goods, wares and merchandise imported;

Be it enacted, etc.

It was easy enough to adopt this preamble and to agree to the sections of the act which followed it, but how should the principles enunciated be carried out? If it was necessary for the encouragement and protection of manufactures that certain things should be done, what should be the basis? Congress sought information for the purposes of intelligent legislation, for it found itself absolutely without information; so an order was passed in the House of Representatives on January 15, 1790, directing the Secretary of the Treasury to apply his attention, at as early a period as his other duties would permit, to the subject of manufactures, and particularly to the means of promoting such as would tend to render the United States independent of foreign nations for military and other essential supplies. Under this order Alexander Hamilton made his celebrated report on the subject of the manufactures of the United States, December 5, 1791. In this report he discussed with profound ability the problems of political economy, and formed the basis of the protective policy of the United States, a plan for an excise and numerous schemes for improved taxation. His report led the way for the vast contributions to statistical science which have constantly been made since his time, and taking the conditions and the means of collecting facts relating to them into consideration, is a masterpiece of official investigation. Its value was of vast importance at the time it was made, but its value is a continuing one, for every student of economic relations, or of the condition of labor, or of the progress of manufactures, or of the development of industrial interests, must make liberal use of his report. No manufacturer, seeking to gauge his output, will for a moment contend that there was little or no value in Mr. Hamilton's efforts; and when we look through the succeeding accounts of the manufacturing industries of the United States it seems to me that he cannot contend that he has not individually, as a manufacturer, been benefited in some way, directly or indirectly, by the accounts of the stock of the nation. The balance sheet of the country is as essential to a knowledge of conditions as the balance sheet of an individual corporation, and this is true notwithstanding the factors of the balance sheets may have been faulty.

In response to the demands of business men the United States Government undertook, at the census of 1810, to secure statistics of production. The result was practically a failure, and at succeeding censuses the same effort produced nothing satisfactory, until the census of 1850, since which time the country has had a fairly satisfactory balance sheet of its business. There are many weak places in the debit and credit sides of the account; nevertheless we are able to tell with approximate accuracy the progress in an industrial sense of the community. The commercial statistics teach every manufacturer, with a degree of accuracy not found in most departments of statistical knowledge, the course of our exports and imports. We know through them whether the balance of trade is with us or against us, and now the enthusiasm which has been awakened by the knowledge of the vast increase in the exportation of manufactured goods is a stimulus to productive industry. To secure and reach foreign markets the manufacturer must have recourse to the statistics of the world. He would be guilty of inexcusable ignorance should he undertake to send out haphazard the products of his factory. He must have a thermometer by which to gauge industrial conditions, and with such a thermometer he can make his calculations. Personal observation in these matters is not sufficient. The experience of a single house is not sufficient.

A few years ago, during one of the censuses of the State of Massachusetts which it was my duty to superintend, a manufacturer came to the census office for facts concerning his industry. He was one of eight or ten manufacturers in his line who had not made returns. He stated that he wished the facts, as he was engaged to make an address on the decline of his industry in Massachusetts. He was informed that in all probability he would not make such an address when he knew the facts, for they were against his thesis. His answer to the census office was: "What do you know about the industry? I have been in it for twenty years, and I know more about it than any census taker." The contention of the census office was that the aggregate statistics of the industry were worth more than his individual experience, especially as his factory had been so conducted during the previous two or three years that he had lost orders and felt somewhat discouraged; but at his urgent request a special tabulation—the general one not having been completed—was undertaken, and with the feeling that he would probably change his subject when he knew the facts. The result was that he made an address before the business association to which he had undertaken to speak, but it was on the development and growth of his special industry. Had he been allowed to take his own course and judge of the industry by his own personal experience, he would have made an address which would have been quoted all over the country, to the effect that that particular industry in the Commonwealth of Massachusetts was on the decline. On the other hand, his address was quoted everywhere in a laudatory manner as showing the prosperity of the old State. This is a concrete illustration of what constantly occurs in statistical offices, one of the chief uses of which is to remove apprehension and correct faulty observation. Take the case of your own great industry, the manufacture of paper and pulp. You do not know the volume of the production of the paper and pulp manufacturers of the United States. You may have your individual ideas about it, and your estimates may be fairly accurate; but no one of you can state, if inquiry be made of you, what the total production of the paper and pulp industry in the United States is at any time or at the present time. You may refer to the census figures of 1890, but you will find that they give only about $75,000,000, as I remember it, as the total value of production. That low figure is the result of the failure of a very large number of paper manufacturers to make returns to the census office or to give the census agents the facts concerning their affairs. You feel, as I have already intimated, that you are being subjected in some way to an official impertinence; that the Government is asking questions about which it has no concern; that it is none of the Government's business what the total output of the paper industry may be. Yet you are asking the questions to-day, Can we not open foreign markets to our goods? Can we not increase the export paper trade? It may be that you are not manufacturing as much paper as can be consumed in the United States. In all probability you are manufacturing more paper than is necessary for home consumption. Would it not be well, therefore, to know the facts before making an appeal to Congress or agitating the necessity for an increased export trade?

It was to answer these questions that the Department of Labor at Washington undertook a few months ago an inquiry of the paper and pulp manufacturers of the United States as to their total output and the relation of that output to the capacity of works. I am sorry to say to you this morning that not more than two-thirds of the manufacturers in the country have seen fit to furnish the information desired. Some of them take the ground that it is a personal affront to make such an inquiry, and yet the officers of the Government who make it can have no personal interest in the matter. It is only that they feel that the great paper industry has not yet been brought sufficiently to the attention of the public, and that it can be brought proper-

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ly to its attention only by the publication of complete facts regarding it.

Another instance which has come under my own observation relates to the cost of production. A few years ago it was my duty, under Congressional direction, to ascertain the cost of producing iron and steel and other commodities in this country and in Europe. Under the investigation it soon became apparent that many works went under simply because of the lack of knowledge of the cost of making some of the products of iron, and in several instances the producers sent back to the experts of the Government for information as to the proper methods of keeping accounts. It would be interesting to know how many failures of manufacturers occur through a lack of knowledge of the cost of production. I imagine that many goods are sold for less than their cost simply because the producer does not understand how to ascertain the true cost.

Another illustration of the value of statistics is to be found in the attempts of men to substantiate certain theories or to back up certain arguments. A few years ago a distinguished member of the House of Representatives, who was very desirous of showing that this country was going to the dogs rapidly through the increase of annual expenditure, sent to an official statistician for a table which should show in one column the population of the country at different periods and the percentage of increase, and in another column the expenditures of the Government with the percentages of increase for the same period; but the statistician, knowing well that any comparison of percentages of increase based on population on the one hand and expenditures on the other would not tell the whole story, added a column giving the production of the country at the same periods, with the percentage of increase, the percentages in the latter column being much larger than those in the column relating to expenditures, and in sending up the table thus completed he stated to the member that he had added this column, thinking that by inadvertence he had neglected to ask for it. The result was that the argument intending to show the downward grade of the Government through expenditures was never made. In such matters one should base calculations on the increase of wealth relative to expenditures, not the increase in population. The head of a family would not think of adjusting his expenditures on the number of persons in his family, but on his income. Here was a very practical illustration of the value of the statistical method when honestly used. It is when the statistical method is dishonestly used, and I regret to say that this is quite frequent, that statistics come into disrepute.

These instances are sufficient to show you the practical value to be derived from the application of the statistical method. A volume could be filled showing the value of statistics to individuals, but the time allotted me does not permit the further presentation of the very many valuable lessons specifically taught by the method. The grandest and chiefest truths derived from statistics, as from all modern undertakings in the way of knowledge, are of progress —progress in material interests, social conditions, purity, education and all that makes up civilization—and of the perpetuation, increased strength and assured endurance of American characteristics. From statistics, with the study of the statutes of a country, we can read the clear track of the growth of intelligent education in the interests of humanity and of the stimulating influences which have built up and fostered the institutions which make this age of mental activity. It is to this science that we must look in the future for much of the expansion of legislative and even general thought, and although the greed with which statistics of all kinds are caught up is, to quote my old friend, General Walker, "almost pathetic," still the science must be fostered, for it is in its infancy. Legislators and its promoters must throw around it such care and guards to accuracy as shall inspire confidence and give to the results the weight of absolute fact.

The lessons of statistics constitute a picture of all that makes up the commonwealth; the population, with its varied composition; the manifold activities, which move it to advancement; the industries, the wealth, the means for learning and culture, the evils that exist, the prosperity that attends it, and all the vast proportions of the comely structure we call State.

Water Conservation — Investigations by the National Government.

By F. H. Newell.

One of the matters of surprise to a foreigner visiting this country, and even to many of our citizens, is the extent of the investigations being carried on by the general government into the resources of the country. This work, although conducted in a scientific manner and by trained specialists, is in its larger features and ultimate object thoroughly practical and for industrial application. It is not only paid for by the people, carried on by men drawn from the common or people's schools, but is intended for the higher development of the people and of the resources of the national domain, this latter term being defined to include the whole United States. There has grown up at Washington a group of scientific bureaus for research, scattered among various departments, but closely affiliated by personal intimacy and by a general unity of aim. Friendly cooperation among these organizations is promoted by scientific and social clubs, and the body of workers as a whole constitutes probably the most notable group of investigators in the world.

To a stranger, seeing only a single detail, the question often occurs, why should the government pay large sums for preparing anod printing well illustrated books, for example, on Tertiary plants, weeds or shrubs which have long since disappeared from the earth, and which, when growing, had no possible use. The reply is given that these plants' remains in the rocks are characteristic of a certain geologic age, and, although at that particular geologic age there may have been formed no ores or minerals of economic value, yet, before or after that period certain coals or iron ores are to be found. In other words, as an ultimate application of the knowledge of Tertiary plants, the expert can say that at certain depths deposits of coal can probably be found, or valuable artesian waters. In short, each abstruse line of investigation leads ultimately to the solution of questions of industrial value.

These investigations by our general government are unique. In Europe, commissions, or experts, are employed to determine certain conditions and to propose remedies for existing evils; but, in the United States, where the past is as nothing to the future, investigations are set on foot, not so much to remedy existing abuses as to anticipate needs. The condition is similar to that of railroad building. In Europe, railroads are constructed where population exists and where there are goods to be carried, while in the United States railroads are built in almost unexplored regions, to bring in a population and to create a demand for transportation. So it is with investigations of the resources of the United States. As a rule, these are planned in anticipation of conditions not now existing. The result of this foresight is shown in the marvelous development with which the country has proceeded—a development due not only to the energy of the people, but also to a certain extent to the fact that the government at all times has published and sent broadcast reports as to the less known parts of the country, attracting and encouraging settlement and the investment of capital.

Information of existing conditions, when obtained by the government, is not carefully guarded and kept away from the people, as is the case in many foreign countries, but every attempt is made to diffuse it through publications attractively prepared and freely given to anyone who shows an interest in the matter. This latter feature is one which has particularly aroused the astonishment and admiration of representatives of foreign countries. To them we can say, we are not afraid of letting the truth be known. Our resources and opportunities are so great that we need not be ashamed of them, and publicity cannot fail to be of advantage.

A description of the work done by the United States Geological Survey was then read, and full details given of the work done, especially in the division of hydrography, after which the reader continued:

The question may well be asked, What is the use of this investigation? The rivers fluctuate from day to day and from month to month; springs appear and dry up, and the water found at a certain place on one day may never appear again, or, at least, not in the same amount. Such questions are not only pertinent, but desirable, for, in any investigation of this kind we must always be ready to answer the question: of what use? For answer, another question may be asked: What is the use of a firm or corporation spending so much money on bookkeeping? It never has the same amount of money two days in succession, and the value of its securities or property is ever fluctuating. One case is parallel to the other. The water resources of the country are in many respects similar to the circulating medium, constantly varying in amount and distribution, and yet, in order that the best use may be made, it is necessary to employ expert skill and the best business judgment, in order to make the largest use of this constantly fluctuating medium.

FLUCTUATIONS OF QUANTITY OF WATER.

The amount of water available, although fluctuating widely from season to season, both in rivers and in lakes, follows the operations of natural laws, and is not as wholly erratic as might be supposed. As a fundamental proposition it may be stated that these fluctuations move in cycles, not necessarily of a given length as of a certain number of years. The smaller cycles we recognize in the change of seasons, and look for floods in the spring and for low water in the fall. In the same way, but with less certainty, we look for a succession of wet years and then of dry years. Much skill and energy has been wasted in attempting to show that these cycles are limited to seven years, or eleven years, or thirteen years, or thirty-seven, or some other length, the diversity of data being such that any man good at figures can prove his case—to his own satisfaction, at least. But none of these cycles seem to meet general conditions. The most that we can say is that whatever has happened may happen again. If we have had extraordinary droughts, these will probably occur with almost equal, if not greater severity, within the next fifty or one hundred years, and the same way with floods and other conditions. It is the recognition of this general law that makes it important to ascertain what are the present conditions, for, although exactly the same conditions may never occur again, yet they must be provided for in all economic considerations. If a great flood in a river has carried away the dams and bridges, the new structures must be built to withstand a still greater flood; if the drought of late summer has stopped the water wheels we must provide storage or supplemental steam power against a similar low stage of water.

There is not only a tendency to recurrence in stream flow, but in the case of all natural phenomena there is a relatively narrow limit or average condition which, when ascertained, gives a point from which to start in making comparisons. This average condition may be represented by a man's estimate of his financial resources; he knows that he has about so much capital at his disposal, and, although this may be increased or diminished within narrow limits, yet for ordinary operations he can depend upon it, and must guard against unusual contingencies. Thus it is with water conservation; the first thing to be ascertained is, what are the usual or ordinary conditions, and what are the extraordinary ones which test the stability or usefulness of our structures.

The business man must not only be correctly informed as to his own resources, but, more than this, he must have a fairly general knowledge of the financial strength of his associates or competitors. He does not stand alone, but in the complicated business world has interests interlocked with hundreds of others. So it is in questions of water conservation. It is not sufficient to know what amount of water a particular stream will furnish, but to determine its industrial value, general facts must be had concerning all streams and all possibilities, in order that money may not be wasted in attempting to utilize a poor water power when a better may be had, or in storing the floods at one locality when structures at another would be cheaper.

It is this class of facts which the division of hydrography is endeavoring to ascertain —not so much to fill immediate needs or to remedy existing defects, but to provide against future contingencies and to stimulate the utilization of the water resources of the country, by furnishing correct information as a guide or warning. In this attempt the work is unparalleled. There is no country of the Old World where such operations have been attempted. The need of foresight in such work is especially notable, for, as above stated, water supply cannot be determined from observations during a single day or month, or even a year. The fluctuations must be measured throughout a series of years sufficient to cover the range of ordinary conditions. It may not be practicable to ascertain the greatest flood or drought of a century, but knowing the conditions for ten years, it is possible to furnish information sufficient for the guidance of ordinary enterprise. In order to give a proper conception of this work it is desirable to outline briefly the methods of work:

METHODS OF INVESTIGATION.

The field work depends largely for its success upon the fact that the height of water bears some relation to the volume of flow of a stream. That is to say, when, upon any arbitrary gage the water stands at 10 feet the volume of flow is not only greater than when at 9 feet and less than when at 11, but is a reasonably constant quantity. We know as a matter of fact that the quantity is not constant, but that when the river is rising there is probably more water flowing at a given height than when the river is falling, and that, when the wind is blowing downstream, the discharge is greater than when the air is moving in the opposite direction. But, taking days and months together, these conditions are balanced against each other, and a fair average results. The first operations, therefore, consist in finding a place where the river has a nearly straight course with permanent bed and banks, and in securing periodic observations of the height of the water, either by automatic devices or direct readings made by an observer. This record of average daily height forms the basis from which computations of flow are made.

At irregular intervals a skilled engineer, or hydrographer, visits the locality, and by current meters adapted to the purpose measures the velocity of various parts of the stream, and from the width and depth computes the flow per second for the then existing height of water. He endeavors to time his visit such that he may obtain the volume of the water when the water is standing at, say, 8 feet, 10 feet, 12 feet, etc., on the gage. As a result, he obtains the discharge corresponding to certain heights of water, and shows these graphically upon a prepared form which gives the height of water by the space from bottom to top of the sheet, and the quantity of water by the distance from the left to the right of the same sheet. This gives him a number of points lying in a nearly straight or slightly curved path. Through, or near these, he sketches a line which in effect is supposed to represent the relation between the height of the water and the quantity of the flow, and from this line he reads off the proportionate flow for each tenth of a foot on the established gage. By means of the table thus prepared he can now set opposite the readings of daily height the corresponding volume, and can estimate the greatest and least flow for the given periods of months, or years, also the average, and can ascertain the ordinary or extraordinary conditions. All these facts are best shown by simple diagrams, which give at a glance the quantity of water for each day of the year, and enable the reader to obtain a general comprehension of the behavior of the stream throughout long periods of time. These diagrams exhibit the time and amount of floods and the duration of low water, showing conditions which otherwise would be a matter of conjecture.

The operations which have been thus briefly touched upon are in reality complicated by detail and extend over many seasons and years. They form the foundation, however, of all of our discussions of water resources and of water conservation. It is impracticable, in fact, impossible, to make any plans, or to proceed with anything like business methods until results of this kind have been obtained, either directly or indirectly. Individuals or corporations, considering matters of this nature, are forced to employ experts, who, from lack of definite information, may make shrewd guesses, but their estimates, not based on the results of long observation, rise little above this level.

APPLICATION OF RESULTS.

It is, of course, impossible for even the national government to measure all streams or any one large river at all important points. The localities chosen are therefore selected with reference to the value of the results not only for the given place, but as typical of conditions existing over other areas. It is fair to assume that if a certain amount of water is delivered by one tributary the quantity coming from another, draining similar catchment areas, will bear a certain relation to the first, dependent largely upon the size of the areas drained. Topography and cultural conditions, however, modify the amount discharged; or, as it is commonly known, the run-off; and for this reason, in making a comparison we must have at hand as complete knowledge as possible of the size and condition of each catchment basin. Such information, in short, as can only be had from good topographic maps, such as those prepared by the division of topography, to which reference has been made. This illustrates one of the close inter-relations between the different divisions of the Geological Survey.

SCARCITY OF GOOD RESERVOIR SITES.

In detailed studies, leading up to water conservation, there are other facts to be borne in mind, besides the quantity of water available and its fluctuations. It is not sufficient to know that there is an excess of flood water which may be held until the time of deficiency. We must ascertain next whether conditions are such that this water can be held, where and the cost. In the northeastern part of the United States, where, within comparatively recent geologic time, the great Northern glacier covered the country, disturbed pre-existing drainage lines, and piling up erratic masses of clay, sand and gravel, there have been left as a result almost innumerable lakes and ponds, forming natural reservoirs. The country, as the geologists would term it, is very new, for the water courses have not yet had time to remove the barriers and to drain the lakes, assuming those more mature conditions which prevail to the south of the glacial terminus in Pennsylvania, and further south and west. Water conservation in this part of the country, by means of storage reservoirs, is relatively easy and cheap. It is merely necessary to replace by low dams the barriers which have been in part eaten away at the outlets of lakes and ponds, and to allow the spring floods to accumulate, regulating the flow throughout the summer.

In the greater part of the United States the natural facilities above noted the not available, and taking the country through it may be said that good reservoir sites are exceptional. In our search for these, hundreds of localities have been pointed out. Examination reveals, as a rule, that the slope of the bottom is so great that the capacity is small, relative to the cost of the dam. In other cases where a valley opens out above a narrow gorge, it is often found that there is no good foundation for a dam, and that enormous expenditures must be incurred in removing gravel and loose rock before a tight and solid joint can be made with the undisturbed strata.

Very often the narrow gorge is the result of geologic forces, which have caused the rocks to be permeable, and if the dam is constructed, water will find its way out to form springs below. To determine these points the services of geologists of the Survey are constantly called into requisition, and the hydrographic work is strengthened by its close bond with this more abstruse interest.

The successful storage of water necessitates considerations which do not apply to ordinary matters of business. We must provide, not for ordinary emergiencies, but for those extraordinary and uncontrollable, such as resulting from the great flood of a century. The interests at stake are not merely of the structure itself, or of the business interests dependent upon the structure, but often of large communities situated below the dam. If a bridge is washed away there is a temporary inconvenience, and the loss of the bridge; but the destruction of a storage dam usually results in something more than the loss of this particular property; it may mean many lives and homes, as well as other innumerable enterprises. While, therefore, the question of cost would limit the size and strength of the structure, the question of safety and of moral responsibility demands most extrordinary outlays in proportion to ordinary benefits received. Thus our storage dams where exposed to floods must be built of a size and strength altogether out of proportion to ordinary uses. In other words, a great part of the capital invested, not yielding any returns.

THE SILT PROBLEM.

Another point which touches upon the domain of the geologist is that of erosion and sedimentation. Where water conservation by storage reservoirs can be made only from construction of dams in a stream draining large areas of country, it is apparent that the life and future usefulness of the reservoir may be affected by the amount of solid material brought down by the stream. In the glaciated regions to which reference is made, the streams, impeded in their course by swamps and ponds, do not accumulate a great load of solid matter. Their waters are usually clear and in striking contrast to rivers in general. The traveler quickly notices this, not only in crossing the rivers themselves, but in the character and the degree of the mud which is offered to him for purposes of bathing or drinking in various Southern or Western States. The heavier particles borne by the river are quickly deposited, but, as seen by the ordinary city water supply, the lighter particles float almost indefinitely. When, therefore, the muddy torrent is checked by an impounding dam, the bowlders are deposited near the upper end, the coarse gravel is rolled along for a few yards, the finer sand drifts down near the dam, and when the flood subsides, the fine particles of clay begin to form a coating over the bottom. In other words, the material eroded, by the rain and running water from the uplands, is transported and left in quiet water below, tending to fill up any depression and to restore the bed of the stream to a comparatively uniform slope.

The rate of accumulation in any storage reservoir varies widely and cannot be satisfactorily arrived at by ordinary estimates. We have sampled many waters, and by measuring the contained mud, prepared figures to show how much of this may be expected to be deposited during a year; but the greater factor—that of the gravels and sand rolled in time of floods—cannot be satisfactorily arrived at by such methods. By taking, however, certain well-known reservoirs in the course of streams, and by carefully sounding these at intervals of four or five years, we hope to be able to obtain figures which are at least suggestive. In the case of one great reservoir, it has been found that in four years the cubical capacity has been diminished by a third; and that, assuming this rate to continue, it will be filled in eight years more. The possible diminishing of the efficiency of a reservoir in such ways is an item to which sufficient attention has not been given in the past, and one which should be given careful consideration in estimating cost and profits from water conservation.

FORESTS AND WATER CONSERVATION.

The above considerations in their practical application limit largely the possibility of water conservation in the States outside of the glaciated area. Nevertheless, storage reservoirs are being built, and must be constructed in the future, if we are to fully utilize the water resources of the country. There is, however, a less direct method of water conservation which should be touched upon, although more fully discussed in other papers. This is through the protection of the source of water, particularly among the mountains of wilder tracts. It is generally believed that forests have a beneficial influence upon water supply, and, although it must be confessed that detailed studies of water flow do not give conclusive data, yet deference must be made to consensus of opinion. From all sides come statements that cutting and burning of the forests and the removal of trees and shrubs from the smaller catchment areas has resulted in the drying up of the springs and a reduced summer flow. Detailed observations of the height of water have not been carried on sufficiently long, nor in such manner as to conclusively demonstrate this point. The nonperiodic fluctuations to which reference has been made are far greater in amount than the influence attributed to forests. In other words, the fluctuations in discharge of rivers, coming from forested areas, are so great year by year as to mask the effect produced by cutting or burning the forest cover.

The careful consideration of the influence of forests in water supply has been greatly hampered by injecting into the discussions preconceived opinions, and by appeals to matters of common knowledge which are really matters of common misapprehension. For example, much of the data rests upon the same foundation as that of the statement of the oldest inhabitant, who relates with firm conviction that the winters are not as cold as when he was a boy, the snow not as deep, and, in short, that the climatic conditions have changed. He is sincere in his belief and unmoved by the fact that the meteorological records do not bear out his assertion. There are, however, certain anomalous conditions that must be recognized, for many engineers agree that deforesting and agricultural operations tend to create a less summer discharge of small streams and a greater winter flow. This must be granted for limited areas, but is questionable for larger ones. The apparent inconsistency in this statement has been discussed by Mr. Thomas B. Roberts, who asserts that "records cannot be produced showing that streams like the Ohio, at Pittsburg, having a drainage area of, say, 20,000 square miles, decline in summer to lower stages, and for longer periods than formerly; or that the rises of fall, winter or spring are greater or more frequent. This is tantamount to saying that the whole is not equal to the sum of its parts." The explanation offered is that the summer flow from any considerable drainage areas, is affected more by the local storms which occur on one day in one valley and another day in another than by the seepage from the relatively small areas of tilled or deforested land. There is need of accurate data upon this topic. We are all agreed, however, that the influence of forests upon water supply, whether great or small, is, on the whole, beneficial, and that the forests, for their immediate value, should be protected from destruction by fire or wasteful methods of cutting.

COST OF WATER STORAGE.

It has been pointed out that within the glaciated areas of the United States water storage is a simple matter, and, inferentially, that the cost is exceedingly small. On the other hand, in the non-glaciated regions, where the topography has been smoothed to such an extent as to do away with marshes, ponds and waterfalls, the storage of water is exceedingly expensive, reaching its maximum in the arid regions where water has greatest value, on account of its use in the production of semi-tropical fruits. It appears from the reports of the army engineers that the cost of water storage at the head of the Mississippi River has been, for five large reservoirs, an average of 32 cents per acre-foot; that is, per acre covered one foot in depth. The largest of these five reservoirs, Lake Winnibigoshish, containing over one million acre-feet, cost 21 cents per acre foot; and Leech Lake, next in size, holding 760,000 acre-feet, cost 23 cents per acre-foot, while the smallest Sandy Lake, containing 73,000 acre-feet, cost $1.57 per acre-foot. In comparison with this are the estimates for California, where the expensive masonry structures and small storage capacity bring the total cost up to from $5 to $50 per acre-foot.

As a result of natural conditions, favorable for water storage, and the occurrence of falls due to the same geologic cause, it has come about that in the Northeastern part of the country water power has been relatively cheap, and developments have proceeded far in excess of other parts of the United States. We cannot hope to duplicate the developments, for nowhere else in the country are the same existing conditions. For this reason the owners of water powers have good grounds for valuing them highly and for seeking to increase

their utility by water conservation wherever practicable, knowing that competition is limited, or handicapped, by unfavorable environment. On the other hand, it must not be forgotten that there are opportunities for success in utilizing many of the reservoir sites which have been discovered. The transmission of power by electricity is apparently making possible the employment of many small water powers which otherwise must be neglected. By building reservoirs along these streams, and by concentrating the power thus obtained in these centres of population, we may expect to utilize many valuable resources now going to waste.

CONCLUSIONS.

Looking at the matter of water conservation in a broad way, it may be said that, taking the United States as a whole, this has hardly been entered upon. Our information regarding the condition of our water resources is still meagre, and it is impracticable to estimate what they may be worth. With the exception of a few notable cases, the water powers now used have not been developed to their complete capacity, and the great majority of the smaller powers have been untouched or abandoned, owing to the fact that the crude machinery in use suffered in competition with modern improvements in steam power. Up to within the last decade the power generated has been practically immovable; but, with the introduction of electrical transmission, it appears to be possible to transmit the power from remote localities to centres of population and to lines of transportation lying within the radius of fifty or one hundred miles. This has stimulated enterprise and opened up new possibilities. The improvement in water wheels, which has kept pace with other changes, and particularly the invention of high-speed wheels using small quantities of water under a great head have opened up new fields for exploitation. Thus it has happened that, instead of confining the possibilities of utilization to a few large and well-known falls, there open out almost unlimited vistas in every direction, affording scope for the imagination of the most sanguine promoter. Actual realization of the development of water power as a business proposition must, however, rest on the solid foundation of facts ascertained, and a close and careful estimate of cost and of benefits. Most of the easily available sources of power having been utilized, it results that those which remain undeveloped depend largely for success upon some method of water conservation, and this is costly, leaving often a narrow margin of profit. Thus, although water powers may, and probably will, be developed manyfold, yet each individual case must be considered on its own merits and with a clear appreciation of all of the difficulties and dangers, as well as of the possible benefits.

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Application of Forestry and Water Storage to Streams of New York.

By Geo. W. Rafter.

New York State is pre-eminent in position by virtue of the fact that it is the only State resting in the ocean and at the same time well grounded on the Great Lakes. From time immemorial the Mohawk valley has been the highway along which passed the commerce between the East and the West. If the proposed Deep Waterway connecting the Great Lakes with the ocean is ever constructed, nature has, from the very beginning, pre-determined just two possible routes, both of which pass through the State of New York: one by way of the Oswego-Mohawk valleys to tide-water, and the other by way of the St. Lawrence-Champlain-Hudson valleys to tide-water. The former of these routes—that through the Mohawk valley—was the pathway from the East to the West when the white man first came. Here the Iroquois warriors journeyed back and forth, and here, where the Dutch patroons built with the fur trade the early beginnings of what is now a vast interstate commerce, is the great highway of to-day. At Rome, the highest point on the divide between the Mohawk River and the Great Lakes drainage, the surface of the ground is only 425 feet above tide-water. This is the lowest pass from the Adirondacks to Alabama; all other lines of communication rise to much higher altitudes than this. Hence it was inevitable that New York State, by virtue of position alone, should become a great manufacturing State, and it is, therefore, not strange that with its vast water powers the paper and pulp business should have developed here far in excess of any other State. Let us see why the great water powers, indispensable to the development of the business fostered by this association, happen to be located on the direct line of greatest commercial activity.

The explanation is partly geological and partly topographical, or, if we consider topography as an outcome of geology, then the explanation is all geological.

THE THREE MAIN WATER CENTRES.

If we examine a contour map of the State, we easily observe that there are three high points which may be denominated water centres, points from which the water flows in all directions. The larger and more important of these is the elevated region known as the Adirondacks, the highest peaks of which rise to an altitude of over 5,000 feet. The second water centre includes the Catskill Mountains in the southeastern part of the State, where the highest points rise to an altitude of over 4,000 feet. The third water centre is the elevated region in the southwestern part of the State in Cattaraugus, Allegany and Steuben Counties, where the highest points are at an elevation of about 2,500 feet; this may be designated as the Allegany centre. The Adirondack water centre is separated from the Catskill centre by the valley of the Mohawk River, which receives drainage from both—the West and East Canada creeks and other tributaries of the Mohawk on the north side of the valley rising in the Adirondack centre, while the Schoharie creek on the south side is an important tributary from the Catskill centre.

In addition to the Mohawk River other important streams of the State issuing from the Adirondack centre are the Black, Oswegatchie, Grass, Raquette, St. Regis, Chateaugay, Great Chazy, Saranac, Ausable, Bouquet and Hudson Rivers.

From the Catskill centre, in addition to the Schoharie Creek, we find issuing the headwaters of the Susquehannna, Delaware and Wallkill Rivers and the Esopus Creek.

The Allegany centre supplies the headwaters of Cattaraugus Creek, Genesee, Chemung, Canisteo, Tioga, West branch of the Susquehanna and Allegany Rivers.

There are three other secondary water centres in the State, but for present purposes the Adirondack, Catskill and Allegany centres may be considered the more important.

The Adirondack centre is a rugged region consisting of primeval granitic rocks, interspersed with sand areas. Here appeared the first dry land on the Western Continent and thus was laid, in earliest geological time, the basis of those fine river systems which, issuing from this water centre, have created water powers of untold value to the citizens of New York. From the very beginning nature had foreordained the State of New York as the seat of future empire.

The geological history of the Catskill and Allegany water centres is quite different. In both these regions the sedimentary sandstone rocks of the Catskill and Chemung groups have attained their greatest development. In the Catskill mountains these rocks are still almost absolutely horizontal, as originally deposited, and in places several thousand feet in thickness. Limestones and other hard rocks, underlaid by shales and soft formations, are found beneath the sandstones on lower stratigraphical horizon. This circumstance has determined, in the process of erosion, the great falls and rapids of the Niagara River amounting to nearly 220 feet; the six falls and the intervening rapids of the Genesee River at Portage and Rochester of about 750 feet; the high falls of the Big Salmon River of 110 feet; the Trenton falls on the West Canada Creek of 500 feet; the Beardsley falls and cascades of the East Canada Creek; the little and great falls of the Mohawk; the falls of the Oswego; Bakers falls and Glens Falls of the Hudson; together with many of the falls and rapids of the Black River and other streams of the northern part of the State. In no State in the Union has nature worked out such water power possibilities as in New York.

INCREASE IN DEVELOPED WATER POWER IN NEW YORK.

In 1882 a total of something like 215,000 horse-power of water was in use in the State of New York. In 1898 there was probably more than double that amount. By way of illustrating this statement, let us consider the water power in use on four of the principal streams of the State in 1882 and in 1898 respectively, viz.:

River.	Net Horse Power in Use in 1882.	Net Horse Power in Use in 1898.	Increase in 16 Years.
Niagara	2,650	45,000	42,350
Genesee	6,880	19,180	12,300
Black	13,000	50,000	37,000
Hudson	12,900	52,000	39,100
Totals	35,430	166,180	130,750

By way of showing to you saliently how far this is from the future possibilities of water development in New York, it may be stated that, with the storage of the streams of this State developed to its full capacity, tnere is a possibility of a final development of water power amounting to substantially 1,500,000 horse-power. This, however, includes 400,000 horse-power on the Niagara River. Truly, when that development arrives with its numerous great manufacturing cities, New York will be indeed the Empire State.

THE ERIE CANAL THAT RETARDED WATER POWER DEVELOPMENT.

An interesting question arises at this point as to how it is, with such potential possibilities, that less than one-third of the total water horse-power of New York is in use in 1898. To answer this question one must consider the history of the Erie Canal somewhat. As the pivotal point of interest we may note that early in the present century the State went into the transportation business and reserved, for navigation purposes, all inland waters tributary to the canals. For a long time everybody believed that the interests of navigation were paramount—forgot, in short, that as a broad proposition the canal could only be of use to the people of the whole State when they had something to transport. The pestiferous idea became prevalent and has even continued to this day that the interests of the middleman are superior to those of the producer. On this line we have heard much of the great benefit of the canal to the people of Buffalo and New York, while the fact that year after year the freight carried for citizens of the State who were themselves producers was growing less and less has been ignored.

FREIGHT BY CANAL VERSUS RAILWAYS.

In illustration of this latter proposition it may be cited that in 1896 the total tonnage of the New York State canals was, roundly, 3,715,000 tons, of which about 565,000 tons were local, that is, that amount of freight originated at points in the State and was transported to other points within the State, while the balance of about 3,150,000 tons was foreign, that is to say, was freight from points outside of the State transported through the whole length of the Erie Canal. As a matter of fact, it was mostly grain carried to market for Western producers. In the same year the New York Central and Hudson River Railway carried 21,000,000 tons of local freight alone. This was the work of but one railway. Vast quantities of local freight were carried by the other through trunk lines of the State, and, while it is true that the railways operate twelve months of the year and the canal only seven months, nevertheless the only deduction to be drawn from these statistics is that the New York State canals are practically of no use to the manufacturer and producers of the State, but so far as any benefit in this State is derived they are maintained for the benefit of the middlemen alone.

THE STATE IN THE TRANSPORTATION BUSINESS

In regard to the statement of the preceding paragraph, that the State went into the transportation business, it may be explained that it is meant by this that the State, in constructing its canal system, went into the transportation business precisely as private companies go into it. That is, the State built its canal system and originally charged heavy tolls on all articles transported thereon precisely as private companies are reputed to do. By way of illustrating how thoroughly the State was in the transportation business, on exactly the same basis as private transportation compines, I may cite that in 1830 the Legislature sent a communication to the Commissioners of the Canal Fund, asking whether it was not possible to increase the rate of toll on many of the articles transported, and stating that it seemed necessary in order to meet all the interests involved that the canals be made to yield somewhat greater revenue. The Commissioners replied to this communication giving in detail the amount of toll levied on different articles transported, ending with the conclusion that it would be impossible to increase the tolls materially because the articles transported were taxed all they would stand; if the rate of toll was made materially greater the commissioners said many articles would not be transported at all, or would go by other channels, as, for instance, by the St. Lawrence River and the Great Lakes. The State would thus lose the benefit of carrying them.

PROFITS FROM THE STATE CANALS.

Along side of the astonishing view that State canals should be operated for all the profit there was in them there grew up the equally pestiferous notion that the State should reserve the inland waters for navigation purposes. As to the profits realized from this policy it is sufficient for present purposes to merely point out that within the first ten years from the formal opening of the Erie Canal the total revenue collected exceeded the original cost of the work of about $2,000,000. We have, therefore, in New York State the extraordinary proposition that the State should hold the streams as against its own citizens for the purpose of developing a transportation business which for many years was operated with reference to collecting the largest possible revenue. No more abominable piece of State socialism has ever been developed in any civilized country.

LAWS OF RIPARIAN OWNERSHIP IN NEW YORK.

As another reason why, in view of the

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superior natural advantages, the development of water power interests in the State of New York has been relatively backward, we may cite the curiously diverse views as to the law of riparian ownership which prevail in different parts of the State. On the lower and middle Hudson River as well as in most of the Mohawk valley all original titles are derived from the laws of Holland as they existed early in the seventeenth century. Under the Dutch law the riparian proprietors owned neither the beds nor banks of the streams, but both remained the property of the State. When the colony of New Netherlands passed into the hands of the English Government the colonists were assured the peaceable enjoyment of all the rights they then possessed. The beds of large streams never having been conveyed became then vested in the English Government as ungranted lands, to which as a consequence of the Revolutionary war the State of New York succeeded in due course.

The English common law, which became in force in the colony of New York after the English occupancy, differs from the civil law of Holland, in affirming the right of the riparian proprietors not only to the banks of non-navigable large streams, but also to the beds thereof, and hence to a right to the flow of the water paramount to that of the State, which can only acquire rights therein by the exercise of eminent domain and the granting of just compensation. This principle applies to all the streams of the State except the lower and middle Hudson and the Mohawk, as already stated.

COMPENSATION IN KIND ON THE BLACK RIVER.

On the Black River still another view has prevailed. Generally the Legislatures and courts of this country have been chary about recognizing the principle of compensation in kind, while in riparian matters this principle is common enough in England. In the United States it has been almost universally held that when the State exercised the right of eminent domain the compensation could not be in kind, but must be in current money of the realm. In 1851, however, when considerable volumes of water were diverted from the Black River for the supply of the Black River and Erie Canals, the Legislature passed an act providing for the construction of storage reservoirs on the upper Black River in order to compensate in kind for water diverted from that stream for the supply of the canals. Successive acts relating to the same subject have been passed from time to time, until at the present there are a series of compensating reservoirs on the head waters of the main river and its two principal tributaries, the Beaver and Moose, making a total storage of over 3,000,000,000 cubic feet. This particular case must be considered as to the advantage of the water powers and is merely cited as illustrating the curiously diverse and illogical practices which have governed the relation of the commonwealth to the inland waters of this State. Its significance is accented when we consider that on the Genesee River, where a considerable diversion for canal purposes has taken place ever since 1825, the riparian owners have not been compensated either by money or in kind, and State authorities have taken the ground that the State is entitled to the water of that stream by reason of a paramount right on the part of the State, which exists independent of and superior to the rights of the riparian owners. These various diverse practices have, undoubtedly, on the whole operated to the disadvantage of water power development in New York.

THE BACKWARD STATE OF MILL OWNERS IN NEW YORK.

As another reason, however, it is only fair to mention the backward state of the proprietors themselves. Many of the developments in this State are still of the most temporary character. The water wheels in use at many establishments are of far less efficiency than they ought to be —and than they would be—if the proprietors had any adequate comprehension of the great loss accruing to them by the use of wheels of low efficiency. Many of the plants have large annual expenses by reason of extensive repairs after each spring flood to dams and head works of temporary character. The constant recurrence of plants of this character can only point to a lack of engineering in formation and a lack of appreciation of sound engineering service on the part of the proprietors which is not creditable to them. Thus, the author has recently examined a new plant costing several hundred thousand dollars where such crude views as to the proper method of constructing rubble masonry have prevailed as to lead, the author is informed, to a waste of from $30,000 to $40,000 worth of cement. On the work in question the contractor was allowed to first build a dry wall and make it water tight by pouring in grout, the company furnishing the cement, at the same time establishing no checks as to the quantity used by the contractor. Under these circumstances it was inevitable that the contractor used cement freely. A statement of the facts indicated an unnecessary use of this ingredient amounting for the whole work,, as stated,, to at least $30,000 to $40,000. There are a number of other points about the same work which are equally open to criticism, but as my present object is not specially to criticize recent hydraulic constructions in New York we will pass to another divison of the subject.

NO GENERAL MILL ACT IN NEW YORK.

As another reason why water power developments are relatively backward in New York we may consider the lack of any general Mill Act. Without special legislation private enterprise has, therefore, been unable, by reason of there being no method of obtaining control of lands to be flooded for reservoirs, to develop power at any point where large areas were to be flooded, or where reservoirs were desired to be created. In the New England States, Virginia, Wisconsin and several others there are a series of enactments known as Mill Acts which, founded in the extension of the doctrine of eminent domain, have as their object the encouragement of the erection of mills. In Massachusetts manufacturing has always been a chief occupation of the people, hence that State was one of the first to embody in its statutes a Mill Act, under the provisions of which manufacturers may exercise the right of eminent domain, acquiring by due process of law private property for the construction of storage reservoirs. The exercise of the prerogative of sovereignty for this purpose is justified on the ground of the common public good. But in New York, by reason of the State going into the transportation business, and consequently adopting the policy of conserving the inland streams for the use of its internal navigation system purely, it has resulted that no general Mill Act has ever been enacted. The most that has been done in this State is to enact a series of special Mill Acts applying to individual streams, as, for instance, the Oswegatchie, Great Chazy, Grass, Raquette, Saranac, Moose, Salmon and Chateaugay Rivers. These several acts were passed at various times from 1865 to 1877 inclusive. In 1898 a similar act, although on quite different lines from the preceding ones, was passed applying to the Genesee River.

By the terms of the acts applying to the Oswegatchie, Great Chazy, Grass and other rivers in the northern part of the State, commissioners are appointed who may erect dams; and, if possible to agree on terms with the owners, purchase the necessary lands taking the conveyance thereof to themselves, their heirs and assigns forever. If they cannot agree on the terms of purchase then title may be acquired under the general condemnation laws of the State.

In the Genesee River Act of 1897 a private company is authorized to condemn lands for reservoir purposes, the State granting the right of eminent domain for such purpose in consideration of the public service performed by the company of checking floods and improving the sanitary condition of the lower Genesee valley, etc.

Summarizing this part of the subject, what is needed by the water power interests of this State is a uniformity of law applying alike to all the streams of the State, and the enactment of a broad general Mill Act which shall permit of developing water storage on any stream to its full capacity without any further powers from the Legislature than those granted in the general act.

WHY FORESTS CONSERVE MILL STREAMS.

Having cleared the ground by pointing out the main reasons for the existing conditions in New York, we may now take up our subject proper, viz.: The Application of the Principles of Forestry and Water Storage to the Mill Streams of the State of New York.

As to the principles of forestry, that division of the subject was extensively discussed at your annual meeting of last year and will be carried no further at present than to briefly point out (1) the rational proposition as to the re-forestation of denuded areas, and (2) the vast influence which a forest covering may exercise on stream flow.

By way of saliently illustrating these points we may briefly consider the case of the Genesee River. The meteorological tables and other data at hand indicate that the years 1844-46 were a period of low rain fall. At Rochester the total precipitation for the year 1844 was 26.43 inches; for 1845, 34.66; and for 1846, 36.03 inches. At Middlebury academy in Wyoming County the total for 1844 was 32.03 inches, and for 1845, 26.01 inches; the total for 1846 at Middlebury academy is not given, but tradition informs us that generally the rain-fall was very low throughout the upper Genesee area for that year. Gaugings of the low water flow of the river made in July and August, 1846, gave for an average of nine gaugings made at various times in these months 412 cubic feet per second. At that time from 65 to 70 per cent. of the catchment area of the upper Genesee was in virgin forest.

In 1895 gaugings of the Genesee River were in process at three places, namely, at Mt. Morris, at the Johnson and Seymour dam in the southern part of the city of Rochester and at the raceway of the Genesee Paper Company in the northern part of Rochester. Probably the gaugings at the raceway of the Genesee Paper Company were the most accurate of all and they indicate that on several occasions the water actually flowing in the stream was somewhat less than 200 cubic feet per second. Adding the amounts actually taken for the use of the canal during that season we reach a total low water flow at Rochester in the summer of 1895 not exceeding 250 cubic feet per second, which is 162 cubic feet per second less than the low water flow of 1846. So far as can be determined, this quantity represents the approximate reduction in the minimum flow of this stream due to deforestation.

As regards the influence which forests exercise on stream flow the author has discussed that phase of the subject extensively in a paper on the "Relations of Forests to the Runoff of Streams," read before the American Forestry Association at its Nashville meeting in 1897. Those interested in this phase of the subject are referred to that paper for the full detail. For present purposes we will merely present a comparison between the runoffs of the Genesee and Hudson Rivers in this State.

COMPARISONS OF GENESEE AND HUDSON RIVERS RUNOFFS.

In the following tabulation exhibiting the runoff of the Genesee River catchment area in comparison with the rainfall and evaporation we have used, for the years 1890 to 1892, inclusive, the rainfall and runoff data of the Oatka Creek, a tributary of the Genesee situated in Livingston, Genesee and Wyoming Counties, New York. This stream has a catchment basin above the point of gaging of 27.5 square miles, and while this area is rather small, still it may be taken in the present case as typical of the whole upper Genesee basin because it is centrally situated and at about the average elevation of the entire area drained. In this table, as well as in the next one relating to the Hudson River, the rainfalls and runoffs are given for a water year beginning with December of the previous year. Thus, by way of illustration, the water year of 1890 begins with December 1, 1889, and ends with November 30, 1890, and so on for all the other years. The gagings of the Oatka Creek began about April 1, 1890, and continued until November 30, 1892. There is, therefore, no actual record of runoff for the months from December, 1889, to March, 1890, inclusive. For these months the runoffs have been computed by methods which it is not necessary to go into the detail of at this time. It is sufficient to say that the record is approximately correct, the variation of the computed quantities from the actual cannot be very great. In the same way the record of the Genesee River itself began on September 1, 1893, hence the runoff of the water year 1893 has been computed for the months from December, 1892, to August, 1893, inclusive. The rainfall records in all these tables are from actual observation. The catchment basin of the Genesee River above the point of gaging at Mt. Morris, New York, is 1,070 square miles.

Without further explanation it may be stated that the following table of runoffs of the Oatka Creek and Genesee River is considered to give a fair illustration of the runoff of the entire upper Genesee basin for the years from 1890 to 1896, inclusive:

GENESEE RIVER.

Stream.	Year.	Rainfall.	Runoff.	Evaporation.
Oatka	1890	47.54	21.21	26.32
Oatka	1891	38.12	14.05	24.07
Oatka	1892	41.69	15.42	26.27
Genesee ..	1893	39.30	13.35	25.95
Genesee ...	1894	47.79	19.38	28.41
Genesee ...	1895	31.00	6.67	24.33
Genesee ...	1896	40.68	12.80	27.88
Means		40.87	14.70	26.17

Approximate.

Gagings of the Hudson River have been made at Mechanicville since October, 1887, the catchment area above the point of gaging being 4,500 square miles. That portion of this area which is above Glens Falls amounting to about 2,800 square miles is still mostly in forest, although perhaps 10 per cent. has been burned over at some time during the last twenty-five years. The burned area has, however, grown up with

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poplar and other rapid growing timbers, and is now again mostly covered with a vigorous and dense growth of deciduous trees. The following table shows the relation of rainfall, runoff and evaporation on the Hudson River catchment basin for the eight water years from 1891 to 1898, inclusive:

HUDSON RIVER

Stream.	Year.	Rainfall.	Runoff.	Evaporation.
Hudson ...	1891	42.96	20.56	22.40
Hudson ...	1892	53.87	33.08	20.79
Hudson ...	1893	42.18	21.91	20.27
Hudson ...	1894	41.37	19.37	22.60
Hudson ...	1895	36.67	17.46	19.21
Hudson ...	1896	45.21	23.63	21.58
Hudson ...	1897	46.51	26.19	20.32
Hudson ...	1898	49.10	27.65	21.45
Means		44.73	23.73	21.08

Examining these two tables it appears that the mean rainfall on the Genesee River catchment basin for the years considered was 40.87 inches, the mean runoff 14.70 inches and the evaporation loss 26.17 inches. On the Hudson the mean runoff for the period of eight years considered was 44.73 inches, the runoff 23.73 inches and the mean evaporation 21.08 inches. These figures become of the most important import when we discover that the mean runoff of the Hudson basin is 9.03 inches greater than that for the Genesee basin and the mean evaporation loss 5.09 inches greater on the Genesee than on the Hudson. When we take into account the fact that the Genesee basin is almost entirely deforested, while that portion of the Hudson area in the State of New York is still largely in forest, we cannot but conclude that the removal of the forest on the Genesee area must have been largely responsible for the vast difference in water yielding capacity which is found to exist. That the deforestation is entirely responsible for the tremendous difference shown by these tabulations the author is not prepared to state. Undoubtedly there are topographical, geological and meteorological differences which may in some degree explain the variation in runoff, but that the entire difference can be explained on any other supposition than that of deforestation the author does not believe. To him, at any rate, it is pretty clear that the cutting of the forests on the Genesee area has reduced the water yielding capacity of that stream by several inches per year. The reason why the Genesee River is not, in its present natural condition, a good mill stream is, therefore,chiefly because of the removal of the forest covering. Why such removal has produced so great a change in water yielding capacity is beyond the province of this paper to point out. We have discussed that particular phase of the subject elsewhere.

In order to emphasize the great difference betwen the runoffs of the Genesee and Hudson Rivers the following comparison of the rainfalls, runoffs and evaporations from year to year, so far as the data can be compared, is submitted:

COMPARISON OF RAINFALLS.

Year.	Rainfall of Hudson Basin.	Rainfall of Genesee Basin.	Difference.
1891	42.96	38.12	4.84
1892	53.87	41.69	12.18
1893	42.18	39.30	2.88
1894	41.37	47.79	6.42
1895	36.37	31.00	5.37
1896	45.21	40.68	4.53
Means	43.66	39.76	3.90

COMPARISON OF RUNOFFS.

Year.	Runoff of Hudson.	Runoff of Genesee.	Difference
1891	20.56	14.05	6.51
1892	33.08	15.42	17.66
1893	21.91	13.35	8.56
1894	19.37	19.38	0.01
1895	17.46	6.67	10.79
1896	23.65	12.80	10.85
Means	22.67	13.61	9.06

COMPARISON OF EVAPORATIONS.

Year.	Evaporation on Genesee Basin.	Evaporation on Hudson Basin.	Difference.
1891	24.07	22.40	1.67
1892	26.27	20.79	5.48
1893	25.95	20.27	5.68
1894	28.41	22.60	5.81
1895	24.33	19.21	5.12
1896	27.88	21.58	6.30
Means	26.15	21.14	5.01

We will not consume time in showing in detail how these figures emphasize the proposition that deforestation of a catchment basin increases the evaporation loss and decreases the runoff, any farther than to point out that while there was a difference in the mean rainfalls for the years considered of 3.90 inches in favor of the Hudson, still the difference in the runoffs is 9.06 inches, or from three to four times what it might be expected to be for the difference of 3.90 inches in the mean rainfalls of the two basins. Again, the difference in the mean evaporation for the six years' period is 5.01 inches. Probably this 5.01 inches represents approximately the mean increase in loss on the Genesee area due to deforestation, while the difference between this quantity and the mean runoffs—or 9.06 — 5.01 = 4.05 inches—may be taken to represent approximately the sum of the several additional losses on the Genesee catchment area over and above similar losses on the Hudson area, due to variations in topography, geology and meteorology, etc. To show why this is probably true will require too much space at this time.

THE PRINCIPLES OF WATER STORAGE.

We may now pass to a brief discussion of the principles governing water storage, the first item demanding consideration being the great variation in the natural flow of streams. In the spring, with the melting of the winter snows, every rivulet is swollen and streams which in August and September are either nearly or entirely dry become raging torrents. Frequently within a week an amount of water flows down the channels of the rivers of this State sufficient to maintain, if distributed uniformly throughout the year, enough water power to drive vast manufacturing establishments and furnish a livelihood for literally hundreds of thousands of people. To so regulate the flow of a stream by water storage as to cause it to flow uniformly throughout the whole year is, therefore, in effect to furnish sustenance for an increased population.

MAXIMUM AND MINIMUM FLOWS OF STREAMS.

By way of illustrating the range of the maximum and minimum flows of streams in the State of New York we may cite data from the Genesee and Hudson Rivers and other streams. In the great flood on the Genesee in May, 1894, the maximum flow from a catchment area of 1,070 square miles was 42,000 cubic feet per second. The total discharge of the stream from 7 A. M. of May 19, 1894, to 7 A. M. of May 24 was, roundly, 6,900,000,000 cubic feet. At the rate of 1,000 cubic feet per second this quantity of water would have maintained the flow of the stream eighty days. Flood flows of from 25,000 to 35,000 cubic feet per second in the upper Genesee are very common.

The minimum mean monthly flow of the upper Genesee may be taken at 0.099 cubic feet per square mile per second. Occasionally for a few days it is probably as low as about 0.080 cubic feet per second. The following table gives the mean monthly flows for a catchment basin of 1,070 square miles as gaged at Mt. Morris for the several low-flow months of the year 1895, that year being, as shown by the previous tables, a year of minimum flow on the Genesee River:

Month.	Mean Flow in Cubic Feet per Second.	Cubic Feet per Second per Square Mile.	Inches on the Watershed.
May	174	0.163	0.19
June	128	0.119	0.13
July	105	0.099	0.11
August	115	0.108	0.12
September ...	100	0.093	0.10
October	104	0.097	0.11

On the Hudson River the maximum flow by artificial storage has been care- April 19, 1896, was 59,400 cubic feet per second. Minimum flows of about 1,080 cubic feet per second have been observed for a few days on several occasions. Expressed in cubic feet per second per square mile, the maximum flow becomes 13.2 cubic feet per second per square mile and the minimum 0.24 of a cubic foot per second per square mile. This latter figure, however, does not take into account diversion for the Champlain Canal, and when an addition is made covering this item the observed minimum flow of the stream properly becomes 0.29 cubic feet per second per square mile. The following table gives the flow of the Hudson River by months during the entire water year of 1895, in which year the flow was the least of any during the period covered by the gagings:

Month.	Year.	Mean Monthly Flow in Cubic Feet per Second.	Mean Monthly Flow in Inches on the Watershed.
December	1894	4,367	1.12
January	1895	3,876	0.99
February	1895	3,543	0.82
March	1895	4,204	1.08
April	1895	23,822	5.91
May	1895	6,850	1.76
June	1895	2,816	0.70
July	1895	2,559	0.66
August	1895	3,901	1.00
September	1895	2,629	0.65
October	1895	2,631	0.69
November	1895	8,421	2.08
Yearly mean and total..		5,780	17.46

By way of further illustrating the variation in the monthly flows we may now consider the year 1892, which was the maximum water year of the Hudson River gaging period:

Month.	Year.	Mean Monthly Flow in Cubic Feet per Second.	Mean Monthly Flow in Inches on the Watershed.
December	1891	8,577	2.27
January	1892	18,857	4.83
February	1892	9,263	2.22
March	1892	10,929	2.80
April	1892	21,554	5.35
May	1892	19,622	5.03
June	1892	12,395	3.08
July	1892	9,287	2.38
August	1892	5,485	1.41
September	1892	4,448	1.10
October	1892	2,819	0.72
November	1892	7,604	1.89
Yearly mean and total..		10,909	33.08

The preceding tabulations show that on the Hudson River the entire flow for the maximum year is about double the entire flow of the minimum year.

THE VALUE OF STREAM FLOW DATA.

The author has at hand similar information for a number of other streams of the State of New York, but inasmuch as an illustration is all that is required space will not be taken for their presentation on this occasion, and this division of the subject may be closed by the remark that the value of such data to the water power interests can hardly be estimated. There ought to be no question about establishing gauge stations under State auspices on every important mill stream of the State. Such data are the business stock in trade of the water storage engineer, and in view of the vast importance of a detailed knowledge of stream flow in the State of New York, not only on account of the canal interests for the last seventy-five years, but further on account of the vast possibilities of water power development, it is a matter of surprise that more extended gangings of the inland waters of this State have not been made. Aside from a few gaugings made by John B. Jervis in 1835 the New York State Canal Department has made no extended studies of this character until those of the Genesee and Hudson Rivers, carried on under direction of the author during the last few years. The reason for this extraordinary neglect is not hard to find; it is the old story of the State going into the transportation business, with the consequent assumption on the part of public officials that the State controlled all inland waters anyhow, and could use them, for the assumed paramount purpose of navigation, absolutely without reference to any other interest in the State.

THE LIMIT OF MINIMUM FLOWS

The Hudson River gagings show that the extreme minimum of 0.29 of a cubic foot per second per square mile has only occurred for two periods, one of six days and the other of five days—a total of eleven days, for the whole period covered by the gagings. For the month of July, 1888, the mean flow may be taken at 0.37 of a cubic foot per second per square mile, and for October, 1891, the mean flow was 0.36 of a cubic foot per second per square mile. In July, 1890, the mean flow for the month was 0.43 of a cubic foot per second per square mile and in several other months, as July, 1893, July, 1895, and September, 1895, the mean monthly flow varied from about 0.59 cubic feet per second per square mile to about 0.61 cubic feet per second per square mile. As a practical proposition it may be said, therefore, that while the Hudson River remains in its present state—for any business where it is not absolutely indispensable to have permanent power—water power may be developed up to the limit of about 0.4 of a cubic foot per second per square mile with a fair prospect of not being stopped on account of low water more than a few days in each year. But for electric power, or any other application of water power requiring an absolutely permanent power every day in the year, the development ought not to be based, under present conditions, on more than about 0.24 to 0.25 of a cubic foot per second per square mile, these latter figures relating specially to that portion of the river from which water is diverted for the supply of the Champlain Canal. At points above the Glens Falls feeder the indications are that permanent power developments may be made up to about 0.3 of a cubic foot per second per square mile. As a matter of fact, nearly every water power on the Hudson River is developed far beyond these figures, but, under these conditions, some portion necessarily stands idle more or less during the low water period of each year. On the Black River, due to the compensation storage, developments may be safely made up to about 0.41 of a cubic foot per second per square mile. If that river were more nearly in its natural state the indications of the rainfall and runoff data are that the

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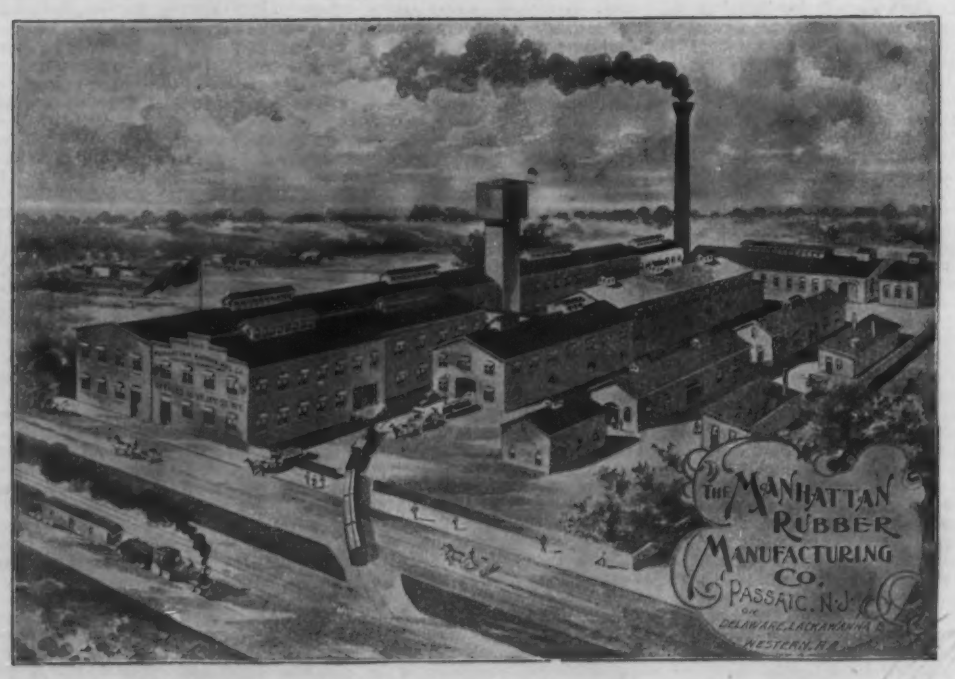

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safe measure of development would be substantially the same as on the Hudson.

WHAT A STORAGE PROPOSITION INVOLVES

Broadly a storage proposition involves the construction of large reservoirs in which the flood flows of what we distinctly call the storage period, which includes the months from December to May, inclusive, may be held back, to be fed out in such manner as to maintain an equable flow during the entire year. As already shown by the last tabulations, streams vary greatly in water yield in different years, such variation being in some degree proportional to rainfall. It is also proportional in different catchment areas to the ground water storage capacity of the soil; sand areas and other porous soils hold back the water which falls upon the surface, while impervious clay soils allow it to quickly run off after each rainfall. Forest coverings also retard the runoff, producing a more equable flow.

THE DATA NEEDED.

In order to develop the storage capacity of any given stream to the greatest possible degree it is necessary to have enough rainfall records, covering the precipitation at points either within or in the vicinity of the catchment basin of the stream, to insure a precise statement of the average monthly and annual rainfall of the basin. It is also indispensable to have a runoff record determined from several years' gagings. In order to place the determination of the flow line beyond all question the gagings should cover at least fifteen years. Whenever we work with much less length of gagings than about fifteen years there is always a chance for more or less serious error. Having the foregoing data, as well as the area of the catchment basin, which can only be satisfactorily determined from a topographical map, we are prepared to compute the average line of flow to which the stream can be maintained, provided its upper reaches contain the required storage ground. There is no way of determining the height of the dam for full development storage until these data are at hand.

RESULTS ON THE GENESEE AND HUDSON RIVERS.

By way of illustrating practical results in this direction, it may be pointed out that on the Genesee River, with rainfalls and runoffs as per tabulations herein contained and with a drainage area of 1,000 square miles above the point where the proposed storage is to be made, the mean flow fixed upon at Rochester where the drainage area is 2,265 square miles, is 1,080 cubic feet per second during the months from May to November, inclusive, and 1,000 cubic feet per second for the balance of the year, the additional 80 cubic feet of the summer months being the amount of water required by the Erie Canal during that period.

The proposed regulation, therefore, is on the basis of 1,000 cubic feet per second for the entire year for the manufacturing interests, or, taking into account that the minimum flow of the stream in its present, natural, unregulated condition is 200 cubic feet per second, the result of constructing the proposed storage will be to increase the minimum flow permanently to five times the present figure. It is estimated that this result can be attained on the Genesee River for an initial expenditure of $2,600,000. The capacity of the storage reservoir to be constructed is 15,000,000,000 cubic feet. The reservoir required to furnish this storage will be nearly 15 miles in length, an average of about a mile in width, and will have an average depth of 60 feet, the depth at the lower end being 118 feet.

On the Hudson River extensive surveys have been made for the construction of a reservoir system on the head waters of that stream. Owing to lack of interest on the part of those to be chiefly benefited by the construction of such a reservoir system, the surveys on the Hudson River have not been completed, no appropriations having been made for the last two years. The work has, however, been carried far enough to indicate that a storage of about 44,000,000,000 cubic feet can be made at an estimated cost of $2,606,000. In regard to this estimated cost it may be stated that a portion of the data was somewhat general, and it is possible that the final figures when obtained may indicate a cost somewhat above $3,000,000. In any case, however, the cost of the storage on the Hudson River is relatively low and would be a good investment for the riparian owners, even though it were to cost considerably more than $3,000,000.

By way of illustrating this latter proposition it may be cited that the estimated cost of the Genesee River storage is $173 per million cubic feet stored, while on the Hudson the estimated cost at $3,000,000 expenditure for a storage of 44,000,000 is only $68.18 per million cubic feet stored. At the figure of $173 per million cubic feet stored, the Genesee River project is considered to be good commercially, and a private corporation has been chartered and organized for the purpose of constructing the work, the income of such corporation to be derived from the sale of the stored water. If such a project is commercially practicable on the Genesee River, much more would it be so on the Hudson.

WHAT CONSTITUTES THE BEST NATURAL MILL STREAMS.

The value of artificial water storage is strongly brought out when we consider that the best mill streams are those with large storage. For example, in New York the Oswego, Black, Mohawk, Hudson, Oswegatchie, Raquette, Grass, Saranac, Ausable and other inland streams with large lakes at their head waters are easily the best mill streams of the State, the reason being that the temporary storage of the lake surfaces has realized in some degree the benefits which would accrue in a much larger degree if those lakes were all converted into storage reservoirs up to the full limit of their capacity. In this connection we may mention the Niagara River, which has the largest storage of all. The Great Lakes, with a surface area above the Niagara River of 87,700 square miles, are in effect a 'vast storage reservoir which practically regulates the flow of the Niagara River to a substantial uniformity. Recent measurements indicate a mean flow of about 230,000 cubic feet per second, which may be expected to vary from a minimum of perhaps 150,000 cubic feet per second to a maximum of 300,000 cubic feet per second, a much smaller range than that of any of the inland streams of the State, the less range being due entirely to the great equalizing effect of the Great Lakes storage reservoir.

In addition to the streams just mentioned which have considerable natural storage, there are in the State the Allegany, Genesee, Susquehanna and Delaware Rivers. together with a number of smaller streams of the southern section, where there is either no natural storage or much less than on the streams of the northern part. As we have seen, the minimum flow of the Genesee River is less than one-third of that of the streams with natural lake storage. The same is true of the Susquehanna and Delaware Rivers and other streams.

The conditions on the Mohawk River may also be specially mentioned. The main tributaries of this stream from the north are the East and West Canada Creeks, which both have large natural lake storage with a consequent low water flow of at least 0.3 of a cubic foot per second per square mile. The main tributary from the South is the Schoharie Creek, which has no natural lake storage and which runs down in dry weather to less than 0.1 of a cubic foot per second per square mile. In both cases the surface slopes are steep and a considerable part of the variation in law water flow is due to differences in natural stroage conditions. However, the fact that the Schoharie Creek catchment area is deforested while the Canada creeks' areas are still largely in forest, as well as differences in surface geology, may be taken into account. Nevertheless, when all proper allowances of this sort are made, it still remains true that the differences in surface storage are contributing causes to the differences in value of these creeks in their natural state as mill streams.

WATER STORAGE SYSTEMS FOR THE CONSERVATION OF WATER POWER COMMON IN THE EASTERN UNITED STATES.

Storage projects with reference to conserving the flood water of the winter and spring seasons in order to foster water power interests have probably been as extensively inaugurated in the United States as anywhere. In foreign countries many vast reservoirs have been created for storing water for irrigation, and for checking floods in mountain streams, but aside from a few cases in France, Belgium and Germany the vast foreign constructions of this character have not generally been for the benefit of manufacturing. In Massachusetts, Connecticut, Maine and New Hampshire, however, under the fostering care of rational Mill Acts, reservoirs for water power purposes alone have been very extensively constructed. Especially is this true in Massachusetts and Connecticut, where practically every stream has its storage reservoir, with the result that the mill streams of those two States may be estimated to be yielding to-day anywhere from 200 to 300 per cent. more power than they could be made to yield if left in their natural unregulated state. Possibly the percentage of increase is considerably higher than this, but in the absence of detailed statistics it is desired to state it conservatively. There can be no question but that the increase is at least as great as 200 to 300 per cent.

WATER STORAGE IN NEW YORK.

Even in the State of New York, where, as shown in the foregoing, we are, considering our natural advantages, somewhat backward, still, from another point of view, we have accomplished a good deal. The reservoirs constructed under the special Mill Acts of twenty to thirty years ago on the Oswegatchie and other streams of the northern Adirondack region have been of considerable value to the water power interests of those streams. The Cranberry Lake reservoir of this series is of considerable extent, and, while no figures as to the increase of flow have been kept, it may still be safely stated as having materially increased the summer flow. Unfortunately the commissioners for these reservoirs did not realize the importance of taking the matter up in a scientific manner and the dams were not only cheaply constructed but were made entirely without reference to the fundamental data of rainfall and runoff in relation to catchment area. As the result of the cheap and temporary character of some of the dams they have been allowed to fall into decay and the reservoirs are now practically out of existence, not because they were not of value, but because the parties managing the affair did not know how to do the thing which they set about doing. It is to be hoped that the increase of the scientific spirit will prevent further erroneous practice on this line in the State of New York.

THE INDIAN LAKE RESERVOIR IN NEW YORK

As an example of a successful reservoir construction, designed for the conservation of water power interests in this State, that on the Indian River, a tributary of the Hudson, built under the supervision of the author in 1898, for the Indian River Company, may be mentioned. This reservoir, which is formed by barring the Indian River at the foot of Indian Lake by a dam about 50 feet in height from foundation to top, raises the water surface of the Indian Lake 33 feet above the original natural surface of the lake, or 23 feet above the crest of a timber dam which has been maintained for logging purposes since about 1845. The new dam built by the Indian River Company is a substantial structure of masonry with an earth embankment at one end, and impounds a total of about 5,000,000,000 cubic feet. The total cost of the reservoir, not taking into account the cost of lands, is, roundly, $98,000, of which $15,500 is for clearing the margins up to the new flow line and $5,800 for the engineering. The cost of the dam proper, therefore, which includes about 11,000 yards of masonry, as well as the necessary rock excavation, earth embankment, riprap wall, etc., was about $76,700. Taking the entire cost at $98,000 and the storage at 5,000,000,000 cubic feet, the cost per million cubic feet of storage becomes $19.60. So far as known to the author this is the cheapest large storage thus far made in the United States.

THE BLACK RIVER RESERVOIR SYSTEM.

Thus far the Genesee and Hudson Rivers are the only streams in New York that have been thoroughly studied with reference to storage possibilities. Something has, however, been done on the Black River, and since that stream presents an exceedingly interesting case because of the adoption there, by the State, of the principle of compensation in kind, we will consider the main points of the Black River reservoir system as it exists at the present time.

Name of Reservoir.	Approximate Area. In Acres.	Approximate Mean Depth. In Feet.	Approximate and Available Capacity. In Cubic Feet.
White Lake.....	296	5	64,000,000
Chub Lake.....	200	4	35,000,000
Sand Lake.....	306	15	200,000,000
Woodhull Lake....	1,118	18	438,000,000
Bisbys Lakes.....	..	3.5	40,000,000
Canachagala Lake..	320	4	56,000,000
North Lake.....	277	28	676,000,000
South Lake.....	372	26	350,000,000
Twin Lakes.....	175	8	60,000,000
Fulton Chain Lakes	..	..	800,000,000
Forestport	700	10	300,000,000
Stillwater	1,675	9	658,000,000
Total			3,677,000,000

The ordinary diversion from the Black River for the water supply of the Black River and Erie Canals is as per the following table:

Month.	Diversion in Cubic Feet per Second.
May	183
June	201
July	216
August	209
September	183
October	164
November	130
Mean	184

The following are the reservoirs which have been constructed by the State in order to make good this diversion:

The Forestport and Stillwater reservoirs are, under the authority of an act of the Legislature passed in 1896, managed by a water power commission consisting at the present time of C. R. Remington, J. P. Lewis, D. M. Anderson and F. W. Babcock.

POSSIBILITIES OF THE OSWEGO RIVER BASIN.

In the Oswego River basin great opportunities for storage exist on numerous large lakes, as may be sufficiently gathered from the following table, which gives the principal lakes of the Oswego basin with their elevations above tide, approximate area of water surface of lake in square miles, and approximate catchment area in square miles:

Name of Lake.	Elevation Above Tide. Feet.	Area of Lake. In Square Miles.	Catchment Area. In Square Miles.
Canandaigua	687.0	18.6	175.0
Keuka	720.0	20.3	187.0
Seneca	443.0	66.0	707.0
Cayuga	380.0	66.8	1593.0
Owasco	710.0	12.4	208.0
Skaneateles	867.0	12.8	73.0
Otisco	784.0	3.0	41.0
Onondaga	364.0	4.0	267.0
Cazenovia	900.0	2.8	9.0
Oneida	370.0	80.0	1300.0
Totals		286.7	4560.0

A storage averaging 10 feet deep over 286.7 square miles would amount to 80,000,000,000 cubic feet.

Unfortunately most of the lakes of the Oswego basin are not available for extensive storage on their surfaces because towns have been located in the level areas at their ends, which would be seriously inundated by any material raising of the high water levels. This adverse condition obtains at Ithaca at the head of Cayuga Lake; at Watkins at the head of Seneca Lake and at Geneva at the foot; at Hammondsport and Penn Yan on Keuka Lake; at Naples, a few miles from the head of Canandaigua Lake, as well as at other points on the lakes of the Oswego basin.

The land damages if the lower portions of these several large towns were to be inundated would be very large, although protective dikes with steam power drainage machinery back of them could be constructed in most of these cases without incurring prohibitive expense. And the author has little doubt but that ultimately the water power of the Oswego River basin will be developed to something like its full capacity by some such means. For the present, however, the ill-judged locations of the towns stand in the way of developing what would otherwise be the finest natural storage in the State of New York.

In addition to the foregoing possibilities of storage in the Oswego basin, opportunities for storage systems exist on the West and East Canada Creeks, tributaries of the Mohawk, and on all the streams of the Adirondack water centre tributary to the St. Lawrence River and Lake Champlain. These latter, however, have never been systematically worked up and little can be said of them in detail. An available site is also found on the Salmon River in Oswego County, as well as in the broad valley of the lower Black River above Carthage, where there is an elegant site permitting of developing the full capacity of the stream to the extent of perhaps 40,000,000,000 to 50,000,000,000 cubic feet. The Delaware, Susquehanna and Alleghany Rivers and other streams of the southern tier do not generally permit of developing large storage systems, although undoubtedly detailed study would lead to the discovery of a few available sites, which would probably be more expensive per unit of storage than on the streams to the north.

THE HUDSON RIVER RESERVOIR SYSTEM.

The following gives the proposed reservoirs of the Hudson system so far as the data have been worked up:

Location. On What Stream or Tributary. River.	Name of Reservoir.	Estimated Capacity. In Cubic Feet.	Tributary Catchment Area. In Square Miles.
Sacandaga ..	Conklinville.	4,000,000,000	900
Sacandaga ..	Lake Pleas't.	1,400,000,000	45
Sacandaga ..	Piseco Lake.	1,725,000,000	55
Sacandaga ..	Arietta Flow.	1,400,000,000	40
Main North..	13th Pond....	439,000,000	14
Main North..	Chain Lakes.	1,819,000,000	58
Main North..	Catlin Lake..	784,000,000	25
Main North..	Lakes Rich, Harris and Newcomb and Goodenow Flow..	2,603,000,000	83
Main North..	Lake Henderson.....	565,000,000	18
Main North..	Tahawus Flow.....	2,101,000,000	67
Boreas	Boreas and Cheney Ponds.....	1,411,000,000	45
Cedar	Wakeley Fl'..	1,819,000,000	58
Indian	Indian Lake..	5,000,000,000	146
Schroon	Tumblehead Falls.....	16,000,000,000	502
Main North..	Hadley.....	4,000,000,000	580
Total		44,066,000,000	

Considerable storage may be also developed on the Kinderhook Creek and other streams in the eastern part of the State tributary to the Hudson, but thus far little is known of these streams in detail. The same statement may be made of the Walkill River and Esopus and Schoharie Creeks.

THE NECESSARY CONDITIONS.

The necessary conditions for applying the principles of storage to mill streams are (1), the existence of either broad, nearly level valleys with narrow throats at the lower ends, or of natural ponds and lakes of considerable area with such throats; (2), these broad level valleys, ponds and lakes must have enough tributary catchment area above them to insure the inflow of large volumes of water to be stored; and (3), the narrow throats at the lower ends should show rock foundations either at the surface of the ground or at moderate depths in order that substantial masonry dams may be built. Thus far most of the storage projects for the benefit of the water power interests carried out in New York have been marred somewhat by the construction of temporary wooden structures, which require considerable expenditure for repairs every few years. This mistake led to the abandonment of some of the early reservoirs. In New England, where experience in the construction of dams is more extensive than elsewhere in the United States, important barrage works are now made chiefly of stone, but in New York the use of temporary timber structures is still much too common. This is the most astonishing, because if a timber dam is well built it is apt to cost about as much as masonry; and indeed there is one case in the State of a timber dam 700 feet long and 20 feet high, built a few years ago, which cost probably somewhat more than a substantial masonry dam would have cost at the same place under the favorable conditions which existed for building that class of dam. Usually when we take into account first cost, repairs, renewals and the fixed charges generally, it will turn out that masonry structures—although generally more expensive in first cost—are the cheapest in the end.

THE INLAND WATERS OF NEW YORK ARE THE STATE'S GREATEST NATURAL RESOURCE.

The foregoing statements, as to present water power development in New York and ultimate possibilities, easily lead to the final statement that the inland waters of New York are the greatest natural resource possessed by this State; hence, any preliminary investigation with reference to the fullest possible development of this natural resource should be made by the State itself, the same as broad investigations of any other natural resource, mineral wealth, for instance, etc. When, however, it comes to carrying out the projects, private enterprise should step to the front, in this way maintaining the independence and dignity of the citizen and avoiding some of the objectionable forms of State socialism fostered by the Erie Canal. As regards the canal, the author believes it can be shown that had the private company known as the Western Inland Lock Navigation Company, and which was chartered in 1792 to open a water navigation from the Hudson River to Seneca Lake, rose to the occasion in the early years of its existence, we would have at this time a canal from the Hudson River to the Great Lakes at least 20 feet in depth and the problem of cheap transportation between the West and the East have been settled at least three decades ahead. Unfortunately, the projectors of this first Mohawk valley inland navigation were too narrow for the contract taken, and relying upon State subsidies adopted makeshift policies, and after dragging along a miserable existence for twenty-eight years—until in 1818 the virile policies of the great DeWitt Clinton prevailed—the Western Inland Lock Navigation Company died by the process of State absorption, which about that time assumed to take unto itself control of all the inland waters tributary to the Erie Canal. Having reached, however, clearer views as to the proper relation between the State and the development of individual enterprise, there can be no question as to the importance of a detailed study of all the inland waters of the State, and in the author's opinion the water power interests of New York could hardly undertake a more useful enterprise than to carry through a bill authorizing such a study. Precedents may be found in Maine and New Jersey, where such studies in detail have already been made.

Moreover, as hinted, there is real danger in attempting to carry out large storage projects before the necessary data have been gathered, as may be sufficiently illustrated by considering the case of the reservoir system at the headwaters of the Mississippi River, where reservoirs have been built with an aggregate storage of about 90,000,000,000 cubic feet. Owing to lack of rainfall and runoff data the flow lines of these reservoirs were placed much higher than necessary, thus greatly increasing their cost. While the total capacity is 90,000,000,000 cubic feet the mean storage is only about 31,000,000,000 cubic feet, the maximum of a nine-year period being about 45,000,000,000 cubic feet. It is clear, therefore, that the absence of precise information as to rainfall and runoff has led, in the case of these reservoirs, to an unnecessary expenditure of a number of hundred thousand dollars.

(The reading of this paper was accompanied by the exhibition of 125 lantern slides illustrating water power and storage dams, and water power developments in the State of New York.)

The Education of Men for the Industrial Professions and Trades.

BY PROF. IRA N. HOLLIS.

The century now ending has had for one of its main characteristics a great increase of material prosperity following naturally upon the invention of the steam engine. The touch of James Watt, like the pressing of a button prepared for some great exposition, started the machinery of the new age. His engine filled a need which had been felt for centuries, and by so doing created new demands which it has been used to satisfy, and new machines and manufactured articles to satisfy still other demands, as modern life has become more comfortable to the average man. The wildest guess of our great-grandfathers could not have foretold what is in the reach of every one to-day. The twentieth century bids fair to become the great mechanical age, which will witness the emancipation of man from toil and the growth of opportunities for mental cultivation of which no other age has ever dreamed. In its influence upon the life of man, therefore, the steam engine ranks with the invention of printing. It has placed the weakest body on an equality with the strongest by giving us a power infinitely beyond either and yet obedient to the lightest touch. Along with its growth and its myriads of application has flowed a tremendous wave of science, probably the companion, or the force, behind all modern invention. We are almost justified in asserting that there existed only the most elementary rudiments of science in the latter part of the last century, and nothing of what has come to be known as applied science in these days. When James Watt began his study of the old model at Edinburgh scientific theories were based more upon the imagination than upon investigation, and they lacked the vivifying influence of practical application to material ends. With this new birth we have also the beginning of a greater interest in education, and the gradual change which has opened the schools to all children alike and made of learning something more than acquaintance with a few ancient authors. A school, and even a university, in the early part of the century contained in its list of courses theology, the dead languages and mathematics, taught with such a memorizing of events and facts as to contribute more to the paralyzing of the ordinary brain than to its development. Only a mind above the average ever emerged from this sea of learning with a better equipment for real life. The medical and law schools hardly existed, and engineering schools were not thought of.

The traditional scepticism of the older business men as to the value of college training for young men springs probably from the absence of rational training in their youth. It is so difficult to kill an idea once firmly planted in the human mind, and the old system existed so many centuries that we still have controversies on the value of higher education for men who are to make business their professions. There are still hundreds of sensible fathers who put their sons into the counting house or the workshop as soon as they get through the public schools, considering four years at the university as lost time.

But the methods have changed, and the oldest schools have been forced to add new courses and to modify their systems of education in order to fit boys for modern conditions, and not for a life in the library or museum. We can depend upon them to give our boys a better start, and in the long run to outstrip those who have not been fortunate enough to get the higher education. Four studious years in college are to-day the best investment that can be made for a youth. Even the study of literature, history and the classics has vastly improved under the rationalizing influence of science. They reach a far greater number of people now than ever before, and they hold a securer position to-day as part of an educational system than they could ever have held as the whole of it. Fundamentally, modern education may be described as the process of stimulating the productive activity, or in placing the ability to do upon an equality with the capacity to think. In this sense the schools are seeking to do what will eventually meet the demands of modern society, of business, of manufacture, of the profession, and even of institutions of learning.

In seeking for the difference between the republic in America and those which are to be found in the histories of rise and decline we find ourselves in the presence

of a new conception of equal rights and of a new machine. Without the first our democracy could not have developed in one century the tremendous vital energy we see on every side, and without the second the distances on this continent would have been too great for homogeneous growth into one people. The Pacific and the Atlantic coasts can be held together only by means of the steam engine, and the consequences which have grown out of it. The two bonds which have been rendered possible by its improvement, the steel rail and the telegraph wire, are essential parts of our government; they seem even more important elements of our republic, so great in size, than a constitution. Along with the extension of railroads and the ease of communication has gone the material development of the whole country. This has reached such a stage that we have now a greater capacity for manufacture than any nation on the globe, and we already produce more than we can use. Even the agricultural products are in excess of the actual needs of the nation. The problem before us, therefore, is how to continue the prosperity of our people, how to maintain a supremacy and to compete in the commerce of the world with Great Britain and Germany, the other great manufacturing nations.

The true solution of this problem can be found only in the education of our young men and women, rather than in artificial barriers set up to protect corporations and industries from competition with foreigners. There are three stages in commercial life: free trade, protection and bounty. It is only one step from protection in the home markets to a bounty which will enable our manufactures to hold foreign markets. That step has already been taken in some European countries. The proper protection to manufacture lies in the schools. The American engineer—and all men who labor with materials may be called engineers—is by reason of the experience and surroundings of our race more resourceful, more intelligent, than his European competitors, and we have only to keep him so in order to retain our superiority in everything pertaining to the working of materials. A careful system of schools should, therefore, be the first consideration in providing for the coming century of keen competition. Up to this time we have stimulated home industry and have permitted in a general way the increased demands for trained men to take care of the schools. Is it an extreme statement to say that the other way around, the careful education of all our young men to meet the problems of trade, will enable us to let the trade take care of itself? We have at least reached a period of our history where this consideration is weighty with possibilities for our future.

Modern industrial conditions differ radically from those of the long past, when success in manufacture depended upon the skill of the individual workman in the craft. The apprentice served several years' tutelage under a master who imparted the traditional methods of a line of predecessors extending back into antiquity. Most things were done by hand, and the few crude labor-saving machines gave little promise of our great workshops. Within the memory of men now doing good engineering work many of the important parts of the steam engine were put into shape by means of a hammer, chisel and file. Men born since the Civil War have no conception of the change in methods of manufacture that have taken place in their short lives. The new industries which have grown up in that time are almost countless. The workshops have become less and less dependent upon skilled labor, and mechanics have become more and more akin to machine drivers, whose duty it is to tend work placed in automatic machines. A greater amount of intelligent direction of a large body of men and a lower grade of actual craft skill is now demanded. We have, therefore, the problem of producing two classes of men, one possessing a high grade of scientific and technical knowledge, and the other a sufficient training with machines to run them efficiently, and, above all else, to know how to employ properly the leisure time which must come with labor-saving machinery.

The United States government has not attacked either of these problems seriously, but has left them almost wholly to private or local authorities. The grant of land to colleges and the small annual appropriation for schools of agricultural and mechanic arts form exceptions to this apparent indifference. Yet we may be satisfied that the American people are not indifferent to the substantial advance in average intelligence throughout the United States which has taken place within a generation. The benefactions of our wealthy citizens afford sufficient proof of this.

Education for the professions seems to grow of itself. Almost all of the universities have now departments of applied science where young men may be trained for the industrial professions. These departments are acquiring the capacity to supply adequate training for given ends, but we have not yet passed beyond the controversial stage. Is it better to educate men in specialties at school or to drill them thoroughly in the principles which underlie a group of allied specialties? That question is still unanswered. There are two kinds of schools for the higher technical training, the separate institutes of technology, which aim simply at the professional degree on top of a secondary school course, and the schools of science or engineering established in connection with colleges. It would be difficult to state the exact difference between the two. They grade into each other in such a way that a marked line of cleavage cannot be drawn; yet the technical school must perforce remain utilitarian to a far greater degree than the college scientific school. It depends for its existence upon the quickness with which it can fit a boy just out of the public schools to make a living. Its curriculum must contain a maximum of special courses in applied science in connection with as much additional study of language and history as the small amount of time remaining for general work will permit. The tendency of the purely technical school is to turn the industrial professions into higher kinds of trade. Not that many men do not rise out of their narrow technicalities into the freer air of the liberal professions, but that the atmosphere of the technical schools is essentially dwarfing to youth.

The other side of this case is the relative efficiency of these schools. Do they actually afford young men the best preparation for an industrial career? It is doubtful. We must keep before us what we want a recent graduate to do. He is not supposed to come out of school endowed with experience acquired only after years in business of manufacturing; but he must be expected to take only a subordinate position, and to be able to acquire rapidly this experience which no school is capable of supplying him. He must have nothing to unlearn, and his education must be sufficiently special to enable him to take hold of something, but it must go deep enough to give him staying powers. It is doubtful if any school which trains mainly in technical subjects can supply men for any but subordinate positions under men who have been able to prepare adequately for their life's work. What is true of the body is likely to be true of the mind. It is rarely a good thing to put a growing boy through a severe course of training for athletic games. The health of the boy and the success of the game are both jeopardized. Time and time again this has been demonstrated. We may even find it mentioned by the Greek writers whose works were written twenty-five centuries ago. We are justified in believing similarly that the human mind in a formative period should not be forced along narrow lines, but should have a large measure of liberal education before undertaking severe application to special subjects. Especially does this apply to those who give promise of larger aptitude in directing the work of other men. The managers of our great enterprises have a higher duty than simply to convert human beings into day laborers, and those who have the power to guide should have the wisdom to guide wisely, so that their employees may not become mere machines. Education should, therefore, give the men who control large industries a foundation of liberal thought and a true perspective. Many youths have no choice, but are obliged to get their living without the investment in time and money which is likely to make them more useful citizens. For these, the separate technological schools are blessings, and we should seek to improve them, while recognizing their limitations.

The colleges allied to scientific schools endeavor to recognize their obligations by giving to young men a larger contact with books and men. We must look to them for the liberalizing of the industrial professions. The growth of engineering as one of the liberal profession may be credited to these colleges. An engineer was a surveyor or workman only a few years ago. Now he holds a station fully on a par with men in medicine, in law and in the ministry. The same thing will be true in a few years of the men who are controlling industries and manufactures. After all, you are all engineers in that you are guiding the forces and shaping the materials of nature to the uses of men. A cordial recognition of this fact will point the way to the proper training for your successors. I think it is to be found in the engineering schools and the departments of applied sciences after sufficient liberal study to stretch the mind to a larger capacity for truth in social and political matters, as well as in the industries which will form their chief work.

When we come to the training of workmen who must labor with their hands we find some things true that do not hold in connection with the mind. Craft skill in a special direction can be acquired only by beginning fairly early. The youth, with his flexible muscles and fingers, can learn much which older men find difficult or impossible. We need many schools, therefore, for the industrial arts where boys can learn trades and the common school branches at the same time. The Mechanic Arts High Schools and the Manual Training Schools, while far better than nothing, do not proceed upon a frank recognition of this want. They are founded for a different purpose. One of the theories upon which great stress is laid by their promoters is that boys and girls require some hand labor as a proper stimulus to the brain. Many children are put into manual training schools, because they have not yet waked up, and consequently cannot do the work of the English and Latin schools. This notion, no doubt, justifies the existence of a few such schools, but it does not recognize the demands of modern industry. What we want in this country to maintain our lead in manufactures is more schools founded upon the theory that a moderate amount of brain work is needed as a stimulus to the hands. They alone can fill the rank and file of our industrial army. It is a matter of some wonder that our large corporations have not recognized this by establishing schools of their own. After all is said about the skill of American workmen we are very dependent upon foreigners. Thousands and even millions of our skilled and unskilled laborers come from Europe. One cannot go into a mill, a drafting room, or a workshop without finding German or Scotch workmen who have learned their business in the old country. There is a tendency to complain about the looseness of our emigration laws. But this very looseness has been the salvation of some of our great shops. It is not by imposing restrictions upon the emigrant that our people should seek to avoid competition with him, but by educating themselves to do better work. We have only to consider the position of our two great competitors in foreign trade to obtain a clear light on this subject. Industrial advances made by Germany during the past twenty-five years have been studied with great interest by our statisticians. Her trade has been extended so enormously that she has to-day agents in almost every seaport of the world. Her schools have been organized in large measure by the central government, the states and the cities toward the end that the great body of the people may be trained for industries and commerce. The English workmen have been left far in the rear, and are to-day in serious danger of losing a commercial preeminence which has lasted two and a half centuries. The British government is alarmed over the prospect, and unless measures are taken to cure what seems to be a growing paralysis, Great Britain will soon rank in the second or third place among commercial nations, if she does not sink even lower. In Germany every art is studied, and every separate branch of trade has its schools. The trades themselves organize these schools, where the government does not undertake it. There are hundreds of them extending their courses down to the smallest questions of manufacture, commerce and technological processes. This is not an accident, but rather the result of deliberate governmental policy. It is not necessary to go into the details of the organization of such schools. They have been studied by competent experts in this country and in England, and many reports have been written about them. Yet neither of the two English-speaking governments has done much to enable its citizens to hold their own against a nation which is not only able to capture the trade of the world, but at the same time to support an enormous standing army in idleness. In this country we are depending too much upon our native intelligence and aptitude for mechanics. These cannot be trusted to place us ahead of another country which is organized to act as a whole. The independence and enterprise of the individual are very well, but we want here co-operation and organization toward a common end. The beginning must be found in the schools. It is in reality the great army of the employed that must be trained and organized. Without such training we are likely to find our labor in the state of demoralization which stamped the late volunteer army on the borders of Cuba. Perhaps with our conceptions of governmental functions it may be well to leave all this work to states and to private benefactors. But every large company for commercial purposes should be required to maintain trade schools under State supervision. It would pay, and the companies themselves would become the greatest gainers from such a system, as it is to the schools alone that they may look for their contented and skillful workmen.

United States Topographical Maps the Basis of the Development of Water Power.

By H. M. Wilson.

A quarter of a century ago a manufacturer considered his individual resources in money and in knowledge of his industry the only capital essential to its intelligent development. The accumulation of wealth in the hands of a relatively small number of individuals and the great strides made in scientific investigation of the resources of nature have revolutionized the methods of conducting manufacturing enterprises of nearly every description. The same forces have been more potent in reducing the costs of production and of handling than have all the scientific and engineering discoveries of the past generation.

The immediate effect of the concentration of capital for the development of an industry has been the employment of skilled engineers to advise and direct the modes of production and manufacture, and these, acting as middlemen, have retroactively stimulated scientific research by inquiry into its discoveries to such an extent as to produce the result we witness here to-day. Imagine, if you can, but ten years ago, a gathering such as this of the manufacturers of so humble a commodity as paper, listening with absorbed interest to essays by specialists on the water resources, the forests or the topography of the United States. The relation between the two seems so abstruse at first glance that it is no wonder it has been overlooked in the past centuries. The student engaged in the investigation of forest or water resources, or in making topographic or geologic surveys, did not himself realize that such an intimate relation could exist as has been developed by the practical engineer under the fostering management of aggregated capital.

Others have told you, or will tell you to-day, of the quantity, quality and the modes of preserving the forest resources from which the pulp and paper industry draws its sustenance. Still others will tell you of the relations of these forests to the water supply by which the forest products are carried to the mills, and by which those mills are made to convert it into a merchantable commodity. My collaborator, Mr. Newell, has briefly hinted at the relation between a topographic survey and the intelligent investigation and development of the water resources. I shall undertake to show you briefly the processes through which a topographic survey is related to an investigation of the water resources, and I shall briefly outline the means whereby such topographic surveys are conducted.

The Federal Government is at present engaged, through the United States Geological Survey, in making a great map of the public domain. This work is being prosecuted simultaneously in all portions of the country, some work having been executed in each State and Territory. This survey is made by skilled topographers, who, from measures taken in the field, construct maps of the territory as they find it at the time of survey. The results of the surveys are published in sheets of the great atlas of the United States, of practically uniform size, of quadrilateral form and bounded by parallels of latitude and meridians of longitude, in such manner that the whole may form a continuous and connected atlas of the entire country, regardless of political or natural boundaries. These atlas sheets are published on two general scales, namely, 1 mile to 1 inch, covering 15 minutes each of latitude and longitude, and 2 miles to 1 inch, covering 30 minutes each of latitude and longitude. The first or larger scale has been employed in mapping the more densely inhabited portions of our country, as the Eastern and Middle States, California, and some scattered regions. The smaller scale is employed in the less inhabited and more rugged portions, as the Southern and Western States. Many thousand such sheets will be required to cover the entire country, the number surveyed to date being over one thousand, of which about nine hundred have already been engraved and published, representing one-fourth of the area of the United States.

The topographic map consists of an exact reproduction of the natural features and of the public culture of the region surveyed. These are mapped in such manner as to show with mathematical accuracy all cities, villages and dwelling houses, all railways, highways, political boundaries and other public features of artificial construction. They also show all features composing surface relief, as hills and valleys, and these are reproduced in such manner as to show not only the surface conformation but to show exactly the differences of elevation. Finally, these maps show the hydrography of the country, by which is meant all lakes, ponds, swamps, rivers, streams and brooks down to those of the smallest dimensions. The maps as issued to the public are printed in three colors—black for culture and names, brown for surface relief, and blue to represent hydrography. The result is pleasing and the difference between the three types of features is so clearly expressed as to render the reading of the maps a comparatively simple process. In addition, in the course of the topographic survey the wooded areas are mapped, and these, while not published in the general edition, are kept in manuscript in the archives of the Geological Survey, open to the inspection of those who are interested to learn the location, extent and distribution of woodland over various portions of the country.

The great difference between these maps and such others of the same regions as existed prior to the making of these surveys is both a difference of quality and of kind. From a scientific point of view, for the uses of the engineer or constructor no maps have existed in this country prior to the making of those now being prepared by the United States Geological Survey. The older general maps are of little value beyond their pictorial and descriptive qualities. They show the relations of various portions of the country one to the other, and in the case of the large scale county maps, published generally throughout the country, they show the roads and streams in plan. The method by which these maps have been constructed are so crude, consisting chiefly of compilations of miscellaneous public or private land surveys, that the distance, and even the direction, between two points at comparatively little distance apart are in error to such amount as to render them valueless for engineering purposes. The surveys on which such maps have been based have been made with the chain and compass and by methods which render it impossible to obviate errors in the measurement of distances and directions when propagated over considerable areas.

On the other hand, the methods employed in making the maps of the Geological Survey are such as to accurately locate throughout the areas mapped fixed points by means of trigonometric intersection, the result being that an error in the detail of the map cannot be propagated beyond such locations, and these are distanced apart from one to five miles. Between these exact locations the details are worked up by more crude methods, but still with such accuracy that the errors produced in the resulting map are not appreciable upon its scale over distances exceding one-tenth of an inch, equivalent on the large-scale map to one-tenth of a mile. In kind the topographic maps of the Government differ from the older maps in that they represent a third element, the relief of the country. The common map shows the country in but two dimensions, in horizontal plane, giving both distance and direction; the topographic map represents the vertical element as well, and with the same mathematical accuracy as it represents the horizontal dimension, and in such manner that the vertical element bears a direct relation to the horizontal dimension, so that by a study of the slopes and shapes of the hills, as shown on the topographic map, one can at once discover the grades in any slope.

From a map so constructed, one in which the distance between two points can be measured with mathematical accuracy, and one on which all elevations and depressions are accurately shown, it is possible for the student of hydrography to at once determine the relations between various portions of the catchment or drainage area of a given stream and the relation between it and neighboring catchment areas. If the problem be to determine the average annual discharge of a stream at a given point upon its course with a view to determining the volume of water available at that point, either for storage in a reservoir or for conversion into power, the old process was to throw a stick into the stream, time its velocity in floating a fixed distance, and make a rough estimate of the volume of discharge at that point. Then, perhaps, from an investigation of the existing high-water marks on the stream banks, a rough approximation was made of the maximum and minimum average discharges of the stream. The errors produced in this, which we now call a reconnoissance examination, were such as to lead to the financial failure of a large portion of the enterprises depending upon results so crudely gathered. Numerous are the unfortunate mill owners who, after constructing an expensive plant, have found their water supply insufficient, and equally numerous are those who, relying upon the evidence of such information, have but completed their reservoirs or their power canals, only to have them carried away by a flood of unexpected proportions. Finally, many of the most desirable sites for power plants have been passed over unsuspected because of the lack of a sufficiently accurate and comprehensive map upon which to discover the relations between the various sources of water supply.

To-day the engineer does not rely upon a cursory examination of a stream as conducted by the above methods, but looks to the evidence of years of careful observation conducted under Government auspices, which shows all the variations in discharge and the greatest maximum and the lowest minimum which may be anticipated through a decade or more of time. He is enabled now to discover with almost infallible accuracy the probable average volume of water available at any point, and the probable maxima and minima discharges with which his construction must contend.

On the other hand, such results are not possible to the hydrographer within the limits of time or expenditure at the disposal even of our Government without the assistance rendered by the topographic map. It would be impracticable to station observers at every important point or at every stream throughout so great an area as that of the United States, and maintain there for a long period of years gauging stations. Some more expeditious and economic method is essential, and this is furnished by a combination of stream measurements made on the more prominent rivers or at the controlling points in each catchment basin with the results of the measurement of precipitation as conducted by the United States Weather Bureau at commanding points upon the same catchment basin, and by the measurement of the areas of these basins upon the topographic map.

Let us assume that the discharge of one of the minor tributaries of the Hudson River, above North Creek, in the Adirondacks, is to be determined. The cursory examination above referred to is not considered as sufficient by the engineer called upon to design a great power plant, yet he cannot wait for the passage of five or ten years during which to make the essential stream measurements of that tributary. In the same way the Government hydrographer has not at his disposal the time in which to have measured this small stream, a process which would have implied the measurement of the discharge of every other stream of at least its size in the entire country. He has, however, determined with accuracy by measurements continued through a period of years the discharge of the great basin of the Hudson to which this stream is tributary, in the neighborhood, let us say, of Glens Falls, above which the topographic and climatologic conditions are not dissimilar to those encountered upon the tributary in question. He has also at his disposal records of the precipitation, both at Glens Falls and at points in the Adirondacks where the annual rain and snowfalls are approximately similar in amount to those occurring upon this particular tributary. Turning now to the topographic maps of the Hudson River basin above Glens Falls, he is able to discover from it the exact area of the drainage basin of that stream above the point in question. The map shows not only the numerous tributaries of the river, but it also shows the elevations and depressions of the country composing its basin, and the dividing line marked by the highest point of land separating the tributaries of the Hudson from those of neighboring streams. On this map he is able, therefore, to exactly measure the area from the summit of the divides of the watershed of the Hudson to the point at which his stream observations have been conducted at Glens Falls. He is now in a position to analyze and discuss the relations between the total volume of water passing his gaging station, both at maximum and minimum discharges, and in average flow. From these he obtains the runoff of the Hudson above his station, by which is meant the volume of water either in cubic feet per second or in inches in depth spread over the entire area. This quantity, the runoff, is discovered to be a certain percentage of the precipitation over the entire drainage basin, the remainder having been dissipated through evaporation to the atmosphere or through percolation into the soil.

Returning now to the topographic map the hydrographer measures the area of the catchment basin of the tributary above the point at which it is proposed to utilize its water supply. He has at his disposal the information furnished by records of precipitation on this and similar tributaries, and he is thus able to discover the percentage of precipitation falling upon this particular tributary, as compared with the precipitation over the entire basin of the Hudson above Glens Falls. Constructing a proportion between the precipitation of the two areas gives him the runoff for his tributary which, being higher up in the mountains, we will assume to be at a higher rate. He also finds that the total precipitation on the catchment basin of this tributary is greater than on that of the entire Hudson. He accordingly obtains as a result a volume of runoff greater, let us say, in cubic feet per second, or in inches of depth, and this, multiplied into the area of the tributary basin above the point under examination, gives the average, the maximum and minimum discharge at that point. Thus, through the means of the topographic map and only by such means, is it possible to promptly and accurately discover the water resources of all or a portion of any region which may be under examination.

Several patents have been taken out upon devices for electric heating. A man in Lynn, Mass., has patented a system of drying paper by electricity. The device will probably work well, but it must be remembered that in drying or heating by electricity it will cost much more than drying by steam direct. This is an unavoidable loss, due to the conservation of energy necessary in electric heating.

Application of the Principles of Water Storage to New England Rivers.

By J. Herbert Shedd, C. E.

New England is a distinct section of the country, having a broken surface of considerable elevation above the sea and somewhat separated from the rest of the United States territory by mountain ranges near its western limit and having for a portion of its northern boundary the range which divides the basin of the St. Lawrence River from the coast slope.

The climate, though perhaps fickle, is equable, and it has a considerable range of temperature and moisture resulting from the nearness of the Gulf Stream on one side and the Arctic currents on the other. The line of the mean annual temperature of 40 degrees runs through the northern portion, varying from month to month from about 10 degrees to about 62 degrees, and that of 52 degrees runs through the southern portion, varying from month to month from about 32 degrees to about 74 degrees. The fluctuations of temperature within the year are less than in the inland sections of the country. These climatic advantages afford a choice of the most favorable conditions for widely differing industries.

The extraordinary indentations of the coast, causing on the coast of Maine a water line of about ten times the general length of the shore, and the sudden dropping of the land surface below the level of the sea, form excellent harbors, favoring the development of ocean traffic. There is a decided contrast between the shore of New England and that farther south, and Point Judith, at the southern extremity of Rhode Island, marks the dividing line between the rock-bound coast of this territory and the low, sloping, sandy Atlantic and Gulf coast of the rest of the Union.

The geological formation is such that a greater number of concentrated falls is to be found here than anywhere else east of the mountain system separating the Atlantic slope from that of the Mississippi or St. Lawrence, and the valleys are so situated as to form favorable lines for railroad construction. The great slopes of the rivers in their working portions are more marked in Maine than elsewhere east of the Mississippi, except on the upper Hudson, and the holding of a relatively high elevation near the coast is favorable to the development of large powers. The conditions are also generally favorable for safe and economical construction of dams and service channels, and in this respect are in striking contrast to those on most of the large rivers further south. The rocks which prevail through the territory are hard and generally so disposed as to be of permanent value in the preservation of the falls.

The healthfulness of the New England climate affords another important condition favorable to carrying on industrial enterprises, while the water available for domestic use is unusually suitable for that purpose, and clear, pure water for manufacturing processes is generally to be found at little cost.

The rainfall is well equalized through the seasons and the great number of lakes and natural ponds favor the equalizing of the yearly flow of the streams, which is more uniform than farther south, and the artificial regulation by reservoirs can be much more economically accomplished than in the Middle or Southern States.

Building materials are abundant and easily secured, including stone, wood, clay for bricks, lime and slate.

Prof. George F. Swain, special agent, Tenth Census, United States, after enumerating the various conditions affecting water power which prevail in New England and contrasting them with those of other sections of the country, says: "Considering all these circumstances, it must be allowed that on the Atlantic slope the streams of New England are in all respects the most favorable for water power, and of the New England streams few will compare with the great rivers of Maine. One cannot read the list of splendid powers in that State, many still lying idle, without becoming convinced that her water power is unsurpassed. Her lakes, many of them lying at a greater elevation than that of Lake Itasca, the source of the Mississippi, or than Lake Superior; her rivers plunging over ledge after ledge of unyielding granite in their short courses from these reservoirs to the sea; her extensive woods, adding their regulating effect to that of the lakes; and her navigable bays and inlets, reaching to the last great leap of the rivers—all these constitute an array of favorable circumstances which, in spite of some opposing disadvantages, would be difficult to equal; and again, after having given many local particulars and results of observations and experiments in New England, he says: "Reviewing what has been written in the previous pages, the topography and the geology of the region, affording a rapid declivity from the mountains to the sea, broken by sudden falls over ledges of hard rock; the favorable character of the bed and banks as regards foundations and freedom from overflow; the favorable arrangement and small extent of the mountain region, the low temperature, causing a large rainfall and a small evaporation; the favorable distribution of the rainfall through the year; the immense facilities for storage; the extensive forests; the absence of very destructive freshets and ice jams; the rock-bound coast, affording facilities for utilizing the large rise of the tide; the prevailing fogs, and the accessibility of the region, together constitute an array of favorable circumstances which may well entitle New England to the first rank as a water power district."

In this discussion the northern slope of Maine, perhaps 70 miles wide and occupied by the St. John River, is not taken into consideration because of its general inaccessibility and the flatness of its surface, giving sluggish streams not usually favorable to water power development.

A good water power involves a good fall, a good volume of water and a reasonably uniform flow, under permanent conditions. These elements are more fully supplied in New England than elsewhere in the country, and the opportunities for artificially increasing the uniformity of flow are more favorable.

The rainfall over New England is larger in amount and more uniform in its distribution through the year than in the Middle States and far more uniform than in the Southern States.

The precipitation in Boston for twenty-eight years in average monthly periods has been as follows:

	Inches depth.
December	3.26
January	3.92
February	3.51
Winter equals 10.69 inches.	
March	4.02
April	3.44
May	3.59
Spring equals 11.05 inches.	
June	3.05
July	3.48
August	4.38
Summer equals 10.91 inches.	
September	3.08
October	4.12
November	4.61
Autumn equals 11.81 inches.	
Total for the year equals	44.46

The precipitation in several river basins is given in the census report of 1880 as follows, in inches of vertical depth:

	Winter.	Spring.	Summer.	Autumn.
Merrimack	.9	10	11	13
Concord	.10	11	11	12
Sudbury	.10	11	11	12
Charles	.10	11	11	12
Connecticut	.10	10	12	12
Housatonic	.10	12	12	12
	59	65	68	73
	Winter.	Spring.	Summer.	Autumn.
Divided by 6 equals	9.84	10.83	11.33	12.17
Boston, as above, equals	10.69	11.05	10.91	11.81

In interior Massachusetts and Southern New England about the following seasonal rainfall may be expected:

10.9	10.9	12.3	11.9

It may fairly be said that about eleven inches depth of rain and melted snow may be expected in each period of three months, with rather more in the autumn than in the winter or spring.

The total rainfall of Maine is probably less than elsewhere in New England, but there is also less evaporation, which tends to keep the available yield into the streams high. The forests have a regulating effect but are much less controlling than a low temperature and a moist atmosphere, which greatly lessen the amount of evaporation. Maritime winds also contain more moisture and thus take up less from the rivers and lakes and from vegetation and tend to a uniform flow of the streams.

It results from the relatively even distribution of rainfall in New England that the freshets are much less destructive than elsewhere, and the low water run is greater.

The chief element of loss between the rainfall and the flow of water in the streams is from evaporation. A portion of the rainfall runs over the surface of the earth into the streams; a portion sinks into the earth and slowly percolates to the streams or by deep underground courses to the sea. That portion which flows to the rivers direct, or through lakes and ponds, is subject to the high evaporation which escapes from open water surfaces. That which percolates through the ground is also subject to direct evaporation from the ground surface, and to a high evaporation through some of the forms of vegetation. It is usually assumed in New England that about half the total rainfall of the year is lost to the streams through the various forms of evaporation and deep percolation. But this loss is not uniform during the different periods of the year. In Massachusetts it has been found that the evaporation from an open water surface amounts in winter to about 3.4 inches vertical depth; in spring it amounts to about 7.7 inches vertical depth; in summer it amounts to about 17.5 inches vertical depth, and in autumn it amounts to about 10.6 inches vertical depth, or a total for the year of about 39.2 inches. The total evaporation from all surfaces combined, and the deep percolation together, amount ordinarily in a year to 22 to 24 inches vertical depth.

The rainfall upon an open water surface for a year in Massachusetts is usually five or six inches greater in depth than the evaporation from the same water surface, but while there is gain from the rainfall in the whole year, there is a positive loss in the summer months from such a surface to the extent of five or six inches depth for the season. The effect of such inequality needs to be corrected by reservoirs in order to avail of the full value of the power of a stream. The above figures in regard to evaporation apply well to southern and western New England, but the temperature and fogs and woods of eastern and northern New England tend to lessen very much the ill effects of evaporation upon the uniformity of flow.

The more important water power basins of New England are those of the Housatonic, the Connecticut and the Shetucket, emptying into Long Island Sound; the Blackstone, emptying into Narragansett Bay; and the Merrimack, the Saco, the Androscoggin, the Kennebec and the Penobscot, emptying into the Atlantic Ocean.

Of these basins the Androscoggin furnishes a remarkable instance of high power producing capacity. The fall, after reaching a point where the river has received the water from seven-tenths of its drainage area, is about six hundred feet through a country well adapted to the establishment of industries requiring power. No other large stream has so much fall for so large a proportion of its drainage area. The Penobscot for six-tenths of its area has a fall of about 190 feet. The Kennebec for seven-tenths of its area has a fall of about 130 feet. The Merrimac for six-tenths of its area has a fall of about 180 feet. The Connecticut for seven-tenths of its area has a fall of about 180 feet, and for five-ninths of its area has a fall of about 280 feet.

The areas of these basins and the falls, in the principal power section of each, are about as follows:

Name.	Area in sq. miles.	Fall of power sec n in feet.	Fall from near head-water to the sea in ft.
Housatonic	1,870	1,140	1,600
Connecticut	9,775	1,100	2,040
Shetucket	1,254	620	1,000
Blackstone	481	726	1,110
Merrimack	4,758	710	1,950
Saco	1,559	410	1,860
Androscoggin	3,270	1,256	2,917
Kennebec	5,715	1,023	3,113
Penobscot	7,910	930	1,808

ILLUSTRATION NO. 1.

The relative positions, shapes and areas of these basins are represented upon the map of the New England States, carefully prepared by Shedd & Sarle, civil engineers, to show their river systems.

The drainage areas of the principal streams, at the point where the last marked fall occurs on each, are as follows:

	Sq. miles.
Penobscot at Bangor	7,910
Kennebec at Augusta	5,715
Androscoggin at Brunswick	3,270
Presumpscot at Falmouth	613
Saco at Saco and Biddeford	1,559
Merrimack at Mitchell's Falls	4,758
Blackstone at Pawtucket	481
Pawtuxet at Pawtuxet	227
Shetucket at Greenville	1,254
Connecticut at Windsor Locks	9,775
Housatonic at Shelton	1,870

The combined effect of rainfall, evaporation and percolation upon the yield of streams has been carefully measured in many instances, and for some streams the measurements have been continued through many years. A few illustrations representing different conditions may be interesting.

I will take three cases for examples; one of a fully occupied stream; another giving uncontrolled natural flow, and a third stream having large natural reservoirs partially controlled artificially.

ILLUSTRATION NO. 2.

First, the Blackstone River rising in Massachusetts and discharging in Rhode Island. This is a well reservoired stream artificially controlled and fully occupied from near its source to its mouth by water power plants. The drainage area is about 481 square miles and the utilized fall is 726 feet. There is developed and usable on this stream, in water power, 22,829 horse power equal to 47.5 horse-power per square mile of drainage area. No other considerable river known to me has developed half that power per square mile of drainage area. The ponds and reservoirs in the Blackstone drainage area measure 13,100 square miles in area. They are about 134 in number and the largest—Quinsigamond—is 1.22, and the smallest, 0.002, square miles in area. The water area is 2.74 per cent. of the total area.

The use of water power on this stream is mainly for textile manufacture, and the mills are usually stopped at night. The measurements of flow which I give were made in the eleven working hours of each day. The diagram is intended to illustrate graphically the average yield of water by the stream in each month of the year. The horizontal base of the diagram is divided into twelve parts, and each part is given the name of a calendar month, but the flow of that calendar month is not always used in ascertaining the average flow for the month as represented. It is more instructive, in studying the yield of a stream, to arrange the discharge for each month in the order of dryness or relative amount of yield for each month of the year. For instance, in the Blackstone the month of least yield is ordinarily July, and, therefore, the month of least yield in every year being classed together and the average taken, the result is plotted over the name July, though the least yield in some of the years probably occurred in some other calendar month. And the month of greatest yield is usually March, and therefore the months of greatest yield in all the years are classed together and the average is plotted over the name of March. The relative vields of all the other months are classed in a similar way and plotted over the name of the month most often giving the yield of that relative amount in the year. The result is that the diagram shows a greater irregularity in the monthly flow than would appear if the averages for the calendar months were given, but not more irregular than actually occurs in the run of the stream. In order that the record of the monthly flow may be more complete, the yield of the month at least flow and that of the month of greatest flow, for each month in its relative position, are plotted below and above the average for that month of the year. The line representing the average flow cannot be expected to be a mean between the least flow and the greatest flow, because the average is deduced from all the records of all the years, and not from a mean between the least and the greatest.

In order that the elements affecting the flow of different streams may be compared with each other it is convenient to reduce the records of the yield of the several streams to cubic feet per second per square mile of drainage area, thus eliminating in a measure the question of size. For instance, speaking broadly, if a given district has an annual rainfall of four feet depth in a year and one-half of this depth is found in the course of the year, flowing in the main drainage stream, the yield of that stream would be equivalent to an average discharge of 1.7678 cubic feet per second per square mile of the area drained. In the case of the Blackstone River the measured discharge represented an average flow through the year equivalent to 2.2966 cubic feet per second per square mile of area drained. This seems very large, but it is to be remembered that the measurements were during the working hours of the day, and in a reservoired stream controlled for day use the night flow would be much less than the day flow.

The vertical distances above the base to the heavier lines, on the diagram of the flow of the Blackstone River, represent the average discharge, in cubic feet per second per square mile, for each month of the year as designated.

The maximum, minimum and average monthly discharge during working hours was as follows:

	Maximum.	Minimum.	Average.
December	2.670	1.809	2.1942
January	2.999	1.975	2.5745
February	3.233	2.066	2.7452
March	5.995	2.937	4.2149
April	4.333	2.414	3.3424
May	2.952	1.841	2.3849
June	2.191	1.504	1.8151
July	1.743	1.225	1.3927
August	1.877	1.330	1.5048
September	2.004	1.346	1.5799
October	2.140	1.452	1.7228
November	2.366	1.777	2.0883
Total	34.512	21.685	27.5597
Average	2.876	1.807	2.2966

7.5139 ÷ 3 = 2.5046 for winter.
9.9422 ÷ 3 = 3.3141 for spring.
4.7126 ÷ 3 = 1.5709 for summer.
5.3910 ÷ 3 = 1.7970 for autumn.

4)9.1866

2.2966 for the year.

It will be noticed that there is still considerable variation in the yield in different months. In order to secure an entirely uniform flow throughout the year there should be provided additional storage to receive the surplus water during those months in which the yield is now above the average and supply it to the stream during the months when the yield is below the average. This could be accomplished by a further storage of about 13.7 per cent. of the annual yield of day use, which would add to the present available supply more than three thousand horse-power. When power is taken, by eminent domain, away from these mills, which are doing business based on the power they use, it is thought to be worth about a thousand dollars per horse-power, but I suppose the value of the addition of new power, requiring new arrangements of mills and business, might be reckoned at, say, half of this, or $500 per horse-power. Even at this rate the new storage basins, if secured, would be worth $1,500,000. Upon such streams as those in Maine, having numerous large natural lakes, the cost of such an amount of storage would be very small.

The amount of increase in the ordinary flow by artificial storage has been carefully observed on the Blackstone, and it was found to be almost exactly doubled. The average minimum monthly yield of a stream like this, in natural condition, is often not more than 20 per cent. of the average annual yield, but in the present improved condition of this stream the average minimum monthly yield is about 60 per cent. of the average annual yield.

The horizontal line, midway in the diagram, represents the average yield of the stream, or 2.2966 cubic feet per second, and is plotted at that distance above the base on the vertical scale. The area below that line, cross-hatched in one direction, represents the quantity of water available up to the average flow of the stream, without further storage; and the area above that line, cross-hatched in the other direction, represents the volume of water yet to be stored to fully equalize the flow of the stream, and it just equals the area, cross-hatched in a similar way below the average line, which represents the amount of water to be drawn from the new reservoirs in the months otherwise yielding less than the average flow.

ILLUSTRATION NO. 3.

I have prepared another diagram, on which the average monthly discharge for each month of the year, in the order of dryness, and plotted in that order, for fourteen rivers, is plotted in sixteen lines. The lines were originally drawn in colors, and could be readily distinguished, but the photograph, giving unequal distinctness for different colors, leaves some of the lines very faint. The general law can, however, be readily followed.

The greatest differences in yield, from the dryest to the wettest month, are found in the smaller rivers. For instance, the west branch of the Croton River—a small stream, of little more than twenty square miles of drainage area—has a smaller minimum average monthly flow than any other stream noted, to wit: 0.170 cubic feet per second per square mile; and it has also the largest maximum average monthly flow, to wit: 7.146 cubic feet per second per square mile. On the other hand, the Connecticut, draining an area of 10,234 square miles, at Hartford has an average minimum monthly flow of 0.648 cubic feet per second, and an average maximum monthly flow of 5.275 cubic feet per second. The heaviest lines show the average monthly flow of the Blackstone, and distinctly exhibit the effect of reservoirs in increasing the dry weather flow.

ILLUSTRATION NO. 4.

Second. The Sudbury River, in Massachusetts. This is a small stream, having only about seventy-six square miles of drainage area, but its yield has been so carefully measured for a period of twenty-two years as to make it a valuable example to study. About 3 per cent. of its drainage area is water surface, chiefly artificial, but the measurements have been so taken as to give the natural yield unaffected by the storage in the artificial basins, except as influenced by evaporation there. I use the stream, therefore, as representing a purely natural flow. It is to be remembered that the variations in the amounts of monthly flow are greater in a small stream than in a large stream. The month of average minimum flow is July, and the month of average maximum flow is March, as in the Blackstone basin. The description of the diagram given for the Blackstone River can be readily applied to this. It will be noticed that the amount of artificial storage necessary to fully equalize the flow of this stream is 35.5 per cent. of the average annual flow, or about two and six-tenths times as much storage as is still needed on the Blackstone. The amount of storage is impracticable in the Sudbury basin.

The maximum, minimum and average monthly discharge, in cubic feet per second per square mile, was as follows:

Sudbury River, in Massachusetts.

	Maximum.	Minimum.	Average.
December	2.875	0.312	1.295
January	4.033	1.323	2.236
February	4.205	1.499	2.753
March	7.584	2.537	4.990
April	5.020	2.058	3.576
May	3.150	0.527	1.617
June	1.659	0.229	0.566
July	0.996	0.067	0.195
August	1.256	0.181	0.412
September	0.998	0.130	0.274
October	1.761	0.275	0.738
November	2.571	0.278	1.039
Total	36.108	9.326	19.689
Average	3.009	0.777	1.641

6.284 ÷ 3 = 2.0947 for winter.
10.183 ÷ 3 = 3.3943 for spring.
1.173 ÷ 3 = 0.3910 for summer.
2.049 ÷ 3 = 0.6830 for autumn.

4)6.5630

1.641 for the year.

The average yield in the stream of 1.641 c. f. s. per square mile is equivalent to a depth of about 1.86 feet in a year saved out of the rainfall.

One million gallons of water per day from one square mile is equivalent to 1.547233 cubic feet per second.

Third. The Androscoggin River, in Maine. This river furnishes, in some respects, the most remarkable water-power basin within my knowledge. A large proportion of its drainage area lies high above the level of the sea, and it is naturally well reservoired near the head waters and in a cool and favorable climate. The water surface of its larger lakes and ponds is estimated to be about six and one-half per cent. of its total drainage area. These lakes are generally deep and well adapted to the artificial increase of depth of storage—a more important condition than mere extent of storage surface. The records of measurements which I give, and from which the diagram is constructed, were made at Rumford Falls, above which point the drainage area is estimated at 2.320 square miles in which the water surface of the larger lakes and ponds is about 4.2 per cent. of the total area. In neither of these percentages is any account made of a large number of small ponds, which exert a favorable influence in regulating the flow. The average annual run of the stream is equivalent to a depth of two feet and two inches saved out of the rainfall.

It will be seen from this diagram that the month of greatest yield is May. This results from the cold weather of winter and spring, which causes the precipitation to be largely in the form of snow, and so delays the melting of the snow as to cause it to give its greatest yield about two months later than that occurrence in southern New England.

The value of natural storage, with some artificial increase and control, is well shown in the fact that entire uniformity in the flow could be secured by an additional storage capacity of about 24.9 per cent. of the annual flow. This is about 70 per cent. of the amount of storage required in such a natural stream as the Sudbury River.

The general description given of the Blackstone diagram can be readily adapted to this one.

The maximum, minimum and average monthly discharge, in cubic feet per second per square mile, was as follows:

Androscoggin River, in Maine.

	Maximum.	Minimum.	Average.
December	1.379	0.901	1.099
January	1.371	0.780	0.987
February	1.289	0.530	0.807
March	1.737	0.366	1.524
April	5.177	2.168	3.608
May	7.289	3.280	5.249
June	3.194	2.190	2.631
July	3.168	1.073	1.629
August	2.086	0.832	1.342
September	1.737	0.970	1.128
October	1.646	1.073	1.164
November	2.466	1.310	1.838
Total	32.539	15.473	23.006
Average	2.712	1.289	1.917

2.893 ÷ 3 = 0.9643 for winter.
10.381 ÷ 3 = 3.4603 for spring.
5.602 ÷ 3 = 1.8673 for summer.
4.130 ÷ 3 = 1.3767 for autumn.

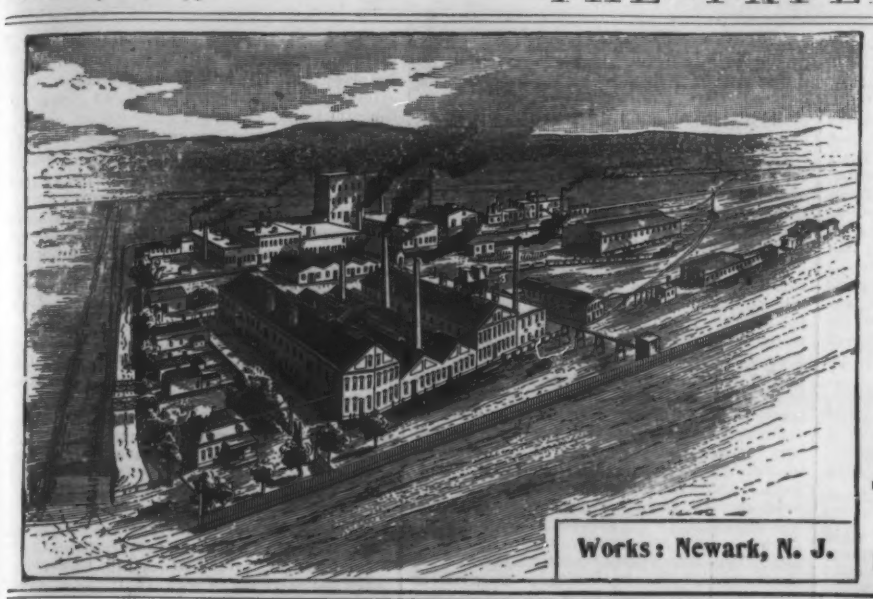
4)7.6686

1.917 for the year.

The saving of so great a depth from the rainfall as is represented by 1.917 c. f. s. per square mile indicates, in addition to a low evaporation, a relatively small loss by deep percolation through the earth to the sea—a loss which there is reason to believe is unusually large from the basin of the Sudbury River.

Another departure from the rule as to the rate of monthly flow in southern New England is noticeable in the winter months, when the yield of this stream is less than in summer. This condition of extreme winter drought does not obtain, probably, on all the streams of Maine, and it is to be easily corrected by reservoir control.

The employment of reservoirs for equalizing the flow is usually the first step in fully developing the water power of a stream. In districts like the State of Maine this is ordinarily accomplished to a certain degree easily and economically. Here the very large number of lakes and ponds give enormous natural facilities for storage, and they are susceptible of great artificial de-



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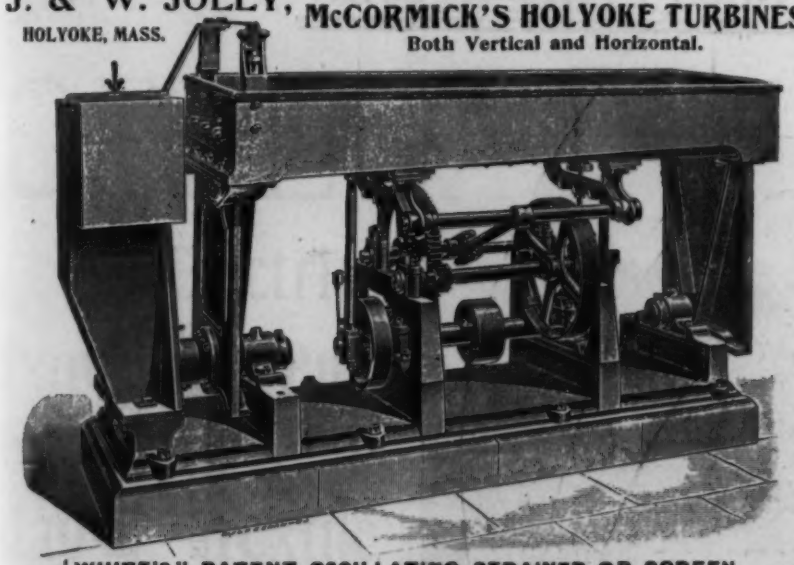

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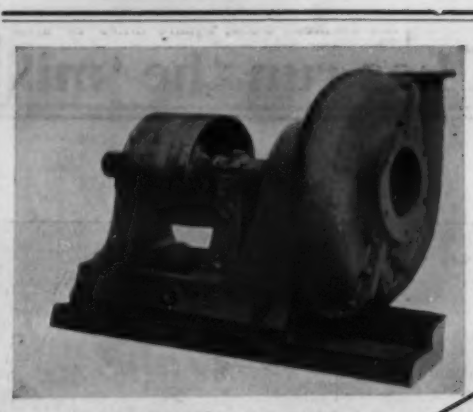

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velopment. The lakes may usually be considerably increased in depth without greatly increasing the area, thus avoiding much increase of evaporation which usually accompanies artificial increase of storage, and their great depth and quiet condition lessen the trouble from ice jams, floating ice and anchor ice.

Wells gives the number of lakes connected with the streams of Maine—not counting small ones—as over 1,600, covering at least 2,300 square miles in area, there being in Maine 1,568 having an area of 2,200 square miles. This gives one lake to about nineteen square miles of territory and one square mile of lake surface to about 12.6 square miles of land surface, and the lakes are not isolated bodies of water, but integral parts of the river systems. The extraordinary fact thus appears that about 7.3 per cent. of the total surface of Maine is in lakes. No other district of equal size in the Union contains so many lakes at such high elevations, having the fall to the sea within its limits.

In the other New England States the lakes are not so numerous, but are still of very great value in connection with the water power.

The cost of the power utilized by reservoirs, even when they are wholly artificial, is usually much less than its value.

It is probable that this country has more water power in use than any other country of the world, and New England's share of this being, in 1880, 34½ per cent. of the whole, is very great in comparison with her area. The census report of 1890 gives the amount of water power used in manufactures by the New England States as 501,629 horse-power, which is 43¼ per cent. of the total horse-power of all kinds used for that purpose.

The relative percentage of water power and steam power in use varies very much among the various industries; those requiring the greater amount of power for a given value of product obtaining it in greater percentage from water. The great power required for wood pulp grinding and for paper making must, in the interest of economy, be obtained from water in order to secure a fair return upon investments in that industry.

The census report of 1890 gives the following amounts of steam power and water power as in use in New England in that year for all kinds of paper making:

	H.P. of Steam.	H.P. of Water.
Maine	812	6,570
New Hampshire	690	2,915
Vermont	126	17,872
Massachusetts	15,213	29,148
Rhode Island	160	.....
Connecticut	4,451	6,659

The total amount being 84,616 horse-power, of which about three-quarters is water power.

I have estimated approximately, in round numbers, the total amount of water power now in use in the several States of New England, and arranged them in the order of their high development as follows:

States.	Area in Square Miles.	Assumed H. P. in Use in 1899.	Development in H. P. per Square Mile.
Rhode Island	1,085	30,000	27.65
Massachusetts	8,040	170,000	21.14
Connecticut	4,845	70,000	14.45
Vermont	9,135	90,000	9.85
New Hampshire	9,005	80,000	8.89
Maine	29,895	160,000	5.35

The development of water power in Maine is relatively small, but no other State in the Union, outside of New England, has even so much per square mile, except possibly New York, which is thought to have nearly the same. The State of Maine is much better adapted to the development of water power than is Rhode Island, and yet five times as much water power as is now used might be developed in it without relatively equaling the amount now developed in Rhode Island. The development of the power of the Androscoggin River to the extent obtaining on the Blackstone, which is easily feasible, would yield a total of 155,325 horse-power, which is nearly as much as is now assumed to be in use on all streams of Maine.

A new demand for water powers has risen in recent years because of their increased availability through electrical transmission. Streams hitherto thought to be too small for the purpose have now, by reservoir storage and electrical transmission, been brought into profitable use. This has been extensively practiced in Germany and Switzerland, and a large increase in such utilization may be looked for in New England, where the conditions are peculiarly favorable for its development. At the present time it is estimated that the amount of water power in use for developing electricity in New England is about 25,000 horse-power, in perhaps fifty to sixty plants, which may be probably 40 per cent. of all such development in the country.

With the advantages which I have tried thus briefly to enumerate it is not surprising that New England is eminently a manufacturing section of the country, and its yet undeveloped resources of natural power, favorable as they are for economical use, must enable its people to continue to hold and increase the prestige of this section as a manufacturing district.

American Water Powers.

By J. T. Fanning, C. E.

The successive periods of our water power histories and developments, which began in the days of Endicott's colonies, although short, have been momentous. The early water-mills almost antedated colonial newspapers, and records of them are now traced only with difficulty in old reports or town histories, often lacking in explicitness and in precision.

It is important that the story of their constructions be now preserved with chronological arrangement, indicating where and what the mills were, and their relations to colonial and national establishment. It is furthermore proper that this chronology, imperfect though it be, shall be preserved in the annals of this Association of Pulp and Paper Makers, which, more than all others, represents an industry that adopted water power as its ally, thrived with the water powers, and has shared with them a marvelous growth.

There were but a few years of colonial struggles before the substitutions of revolving mill stones for mortar pestles in preparation of foods, and substitutions of muley saws for whip saws in constructions of shelters, became necessities.

The colonists from Holland were familiar with wind-mills, and colonists from England were familiar with horse-powers, and but few of the colonists had knowledge of water-mills, so that to them early water-mills were innovations.

FINANCIAL RESTRICTIONS.

If now this audience takes a broad view over American industrial developments from the days of the early wind and horse-power mills to the present time it will observe how intimately the water power developments were at first connected with struggles to meet the personal necessities—the needs of food and shelter of the colonists—a little later with the struggles against the restraining measures along industrial lines of the mother country, and later with stemming the flow of manufactured paper and textile goods from the mother country to the shelves of our merchants, and, lastly, with meeting boldly the industrial competitions of all the world's centres of industries.

In the early, trying times silver coins were scarce, a shilling represented much labor, and gold coins were rarely seen and, by the majority of persons, scarcely known of except as fabled in the pot of gold in the end of the rainbow. Then corn in the Northern colonies and tobacco in the Southern colonies were the currencies in common trade. The mechanical works of those days were consequently such as each projector could accomplish with his own manual labor, with spare cash investment.

EARLY MILLS.

Turning now to the meagre colonial records, we shall find some hints of how much was done by personal effort in a small way, and how soon various small mills were set up after the arrival of the first colonists.

Endicott's first colony erected a water grist mill at Dorchester, Mass., as early as 1628. In 1631 there was a tide mill for grinding corn in Boston, on Mill Creek, and in the same year a saw mill was erected at Neponset, in Massachusetts.

So early as 1634 a more ambitious effort was made at the lowest fall of the Charles River, where a low stone wier was built across the river and a mill-race or canal was excavated to lead water on to the flutter wheel. In those days a journey of 30 miles to mill with a grist on the back of a bull was not an unusual experience. Soon after 1634 corn mills began to multiply in various parts of the colonies, and their equitable management became a matter of so much moment that the General Court of Massachusetts, in 1638, issued regulations respecting them.

A Massachusetts colony, following New Hampshire, erected a saw mill in 1638. The colony of Maryland is reported to have raised funds by subscription, in 1639, to aid in building its first water power mill for corn. Pennsylvania followed with a water grist mill on Cobb's Creek near the site of Philadelphia, in 1643.

The court in 1661 granted Winthrop (afterward governor of Connecticut) the right to set up a saw mill near New London, and encouraged the work by special privileges. The town of Norwich, Conn., in 1680 gave Captain Fitch a grant of land for his encouragement to set up a saw mill.

In the latter year there were reported water grist mills on Rancocas Crek and in Trenton, in New Jersey, and two years later William Penn's colony arriving on the Delaware River brought as part of their cargo the frame of a mill which they set up and in this mill ground their corn. In 1682 there were reported six saw mills at Piscataqua, N. H., and six others at Kittery, Me., and eighteen other saw mills in other water power localities in Maine.

In these colonial days we recognize the germ of American genius that has since asserted itself, for we read that in 1698 an Englishman, writing home from the Pennsylvania colony, said, "The water mills far exceed those in England, both for quickness and for grinding good meal," and we also read that an American gang saw mill was purchased for use in an English dock yard because of its superior capacity and product.

In 1693 we learn of the manufacture of paper by hand processes at Roxborough, followed by other mills in Pennsylvania, in New Jersey and Delaware, but the paper makers were not yet conspicuous among the developers of water powers. The housewives were as yet spinning their yarns of flax and wool at their own firesides, and the muslins and broadcloths were imported luxuries for the fortunate few.

Nevertheless, there were, by the year 1700, beginnings of exportations of flour, boards and yarns to other colonies of the mother country that attracted the attention and alarm of her statesmen. The English Parliament was therefore constrained to pass an act imposing a fine for the colonial exportation of manufactured goods, and forbade the exportation from Great Britain of textile machinery, in order to prevent the American colonies from procuring such machinery to be operated by the American water powers.

Thus, through hardships, through oppressions, and through poverties that suppressed their industrial advances, came the American colonies to the declaration of their independence and to a long and exhaustive war to sustain the rights and privileges so necessary and so dear to them.

CONTEMPORARY INFLUENCES.

The chronological history of one given industry involves statements of dates such as are sometimes found monotonous. We are dealing historically with hydraulic developments that underlie the contemporaneous developments and chronologies of the flouring industry, the lumbering industry, the textile industry, and the pulp and paper industries.

These, with the chronological developments of the other manufacturing industries, with the like developments of commerce, and with the like developments of financial possibilities, and, more especially, with the developments in the successive generations of men of genius, indomitable energy and courage, form a picture of national progress since the establishment of the American Union which is of surpassing interest.

In treating of our present assigned portion of this national development it is the dates that fit our history into those contemporaneous influences that gave rapid developments and successes at one time or one place, and gave depressions and discouragements at other times and places, and fits the resultants of advance in each pulsation of the ups and downs of our national industrial expansion.

A SECOND INDUSTRIAL FACTOR.

The American Revolution covered a period separating distinct phases of American industries. In the retrospective view we observe beyond it results that by present comparison seem insignificant, wrought when the colonists were almost without temporal hopes. This side of it we observe repeated courageous effort and expenditures encouraged by hope, not always fully realized, but leading to surpassingly great accomplishments in works as seen now in the aggregate.

In 1790 Congress passed an act for maintaining the public credit, and for adjusting the Revolutionary War debt, and in the same year passed the first American patent law, encouraging inventions and protecting inventors.

A new industrial era was thus auspiciously inaugurated, and then the beginning of the textile industry introduced a new factor in the development of American water powers.

A modest attempt had been made at Beverly, Mass., in 1787 to spin cotton and woolen yarn by machinery driven by horse-power, and later similar trials were made at Philadelphia. Then, in 1793, Eli Whitney perfected his cotton gin, and in 1797 Amos Whittemore invented his card setting machine.

About the time the pioneer mill at Beverly was started a mill was erected at "the Falls" in Norwich, Conn., then prominent in ship-building, for the spinning of hemp

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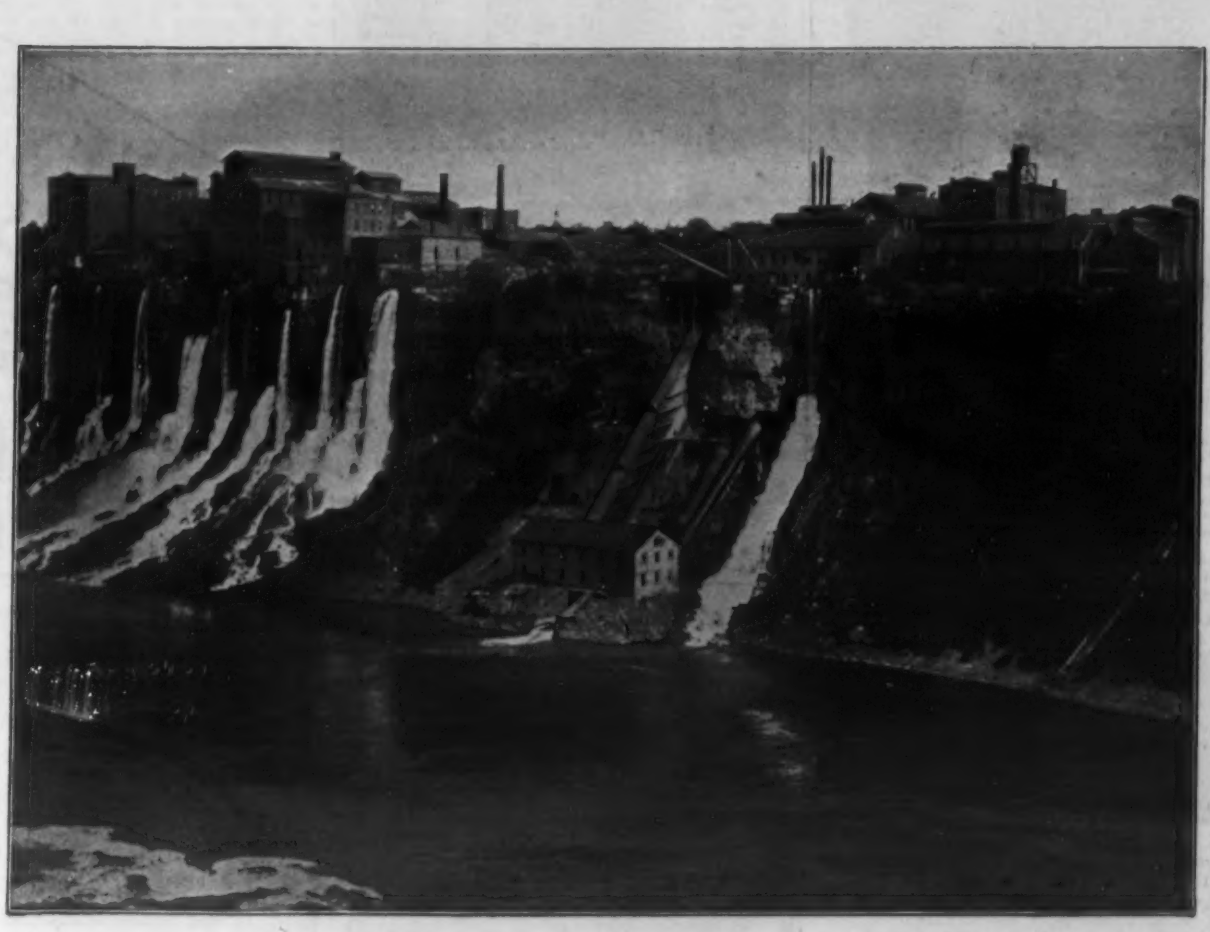

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60,000 pounds of Pulp per day.

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CLIFF PAPER CO., Niagara Falls, N. Y.

and weaving of duck, and two rope walks were there in operation. During the maritime war between France, in England, in 1801-1802, Norwich became in consequence of its manufactures the base, on this continent, of ship supplies of the fleets of both contending nations.

SLATER'S APPLICATION OF POWER.

The possibilities of home manufacture of textile goods, finer than domestic homespuns, was at that time being earnestly discussed by American merchants.

The stories of this discussion reached in England young Samuel Slater, an experienced manufacturer of marked mechanical genius, who soon came and met merchants of Providence, R. I. As a result, he built, with their encouragement, some cards, weaving frames, and spinning frames to demonstrate his ability, and set them in operation at the falls at Pawtucket, R. I. This, in 1790, is reported to be the first spinning of cotton in America by the aid of hydraulic power, and by means leading to both mechanical and financial success.

In the following year William Pollard's newly invented water spinning frame was erected near Philadelphia. In 1793 the "Old Slater Mill" was built at Pawtucket and was the first successful cotton mill construction and operation in America.

Before the completion of the first Slater machines several mechanics were striving to invent machines for spinning, such as England then had and withheld, under a penalty for their exportation, in fact, or by drawing or by description.

We see the evidence of the early farsightedness, progressiveness and enterprise of the citizens of Massachusetts in the acts of her legislators, who, in the year 1786, granted £200 ($1,000) to John Cabot and Joshua Fisher to assist in equipping the Beverly mill above mentioned. Just previous to the year 1790 mechanics were devoting their studies and labors to producing woolen yarns and to fulling woolen cloths by aid of power, and small stocking mills and woolen mills began then to be operated. President Washington, journeying in New England, visited a mill where broadcloth was finished, near Hartford, Conn., and was so much interested that he ordered cloth for suits for his servants at home, and for himself, and in 1789 Washington read his message to Congress while dressed in this suit of domestic wool.

WORKS OF THE NEW UNION.

Peace and stability of government after the Revolution encouraged a great flow of immigration and encouraged enterprise, manufactures, agriculture and commerce. The acreage of wheat multiplied, new flouring mills were built, and flour began to be exported in considerable quantities. New colonies were planted farther inland and the farmers began to take up lands west of the Hudson River, even so far as about the eastern end of Lake Erie. Flouring and saw mills were established at Genesee Falls, in New York, as early as 1789, at Rotterdam as early as 1794, and at Seneca Falls as early as 1798, while nearly a thousand small mill sites were occupied in the thirteen original States before the opening of the year 1800. The lumbermen were also pushing their camps higher up the streams of Maine and, occupying the rapids for power and shipyards, were building schooners to distribute the manufactured lumber to the Atlantic Coast towns.

In the early colonial era a sawyer pointed with pride to his new mill in which he said two men could cut 4,000 feet of boards in twenty-four hours. In the new era the water powers brought into use for sawing were larger and the daily cut per mill multiplied more than twenty-fold.

The successful development and profitable use of many small water powers led to investigations of more ambitious hydraulic enterprises. The falls of the Passaic, in New Jersey, was one of the first to attract attention as a source of large power and a nucleus about which various manufactures might be grouped. The Legislature chartered a company in 1791 with ample privileges to build the power and conduct various manufactures, and the construction of the water power was started on a plan of comprehensive proportions. The scale proved, however, in advance of the times and its expense called for more cash than could then be found available. A little later a portion of this power was brought into use for cotton spinning, and became later the nucleus around which have grown the important silk and other industries of the city of Paterson.

DOMESTICS.

Notwithstanding so much advance had been made in invention at the opening of the present century the hydraulic powers were not yet making the finished cloth products. Until about the time of the war of 1812 the mills were spinning the wool and cotton yarns, and nearly every farmhouse in Eastern New England was furnished with a loom and nearly every housewife was a weaver. As above we observed the farmers bringing home their grists from the mills, so now we observe the women bringing home from the spinning mills sometimes 6, 8 or 10 miles, their bundles of wool or cotton yarn to weave cloth for their households or for the market at prices of 3 to 7 cents per yard, according to the nature of the cloth.

The war of 1812 shut out foreign competition and gave an increased demand for domestic goods and a stimulus to manufacturing. The operations of the year 1813 were eventful, especially in their influences upon the water power developments and the expansion of the industries that have clustered about them.

In this year Messrs. Francis C. Lowell and Patrick T. Jackson, merchants of Boston, bought the "Bemis" power in Waltham, Mass., on the Charles River, and equipped it with 1700 spindles with cards and power looms. This was the first American mill producing under one roof from raw cotton the finished cotton cloth, which it did successfully.

The success of this small experiment led shortly to the erection of a second water power mill at Waltham, equipped with 3,584 spindles with full machinery to produce finished cloth, which was a second mechanical and financial success. Competition with foreign mills had long been trying, and often discouraging, but its success was now assured, and attention turned rapidly to the waterfalls of the principal rivers of New England.

About 1820 stimulated enterprise called from France the Fourdrinier paper machines, and in 1830 the Phelps and Spofford cylinder machines were perfected at Windham, Conn., and then the paper makers became well established mechanically with the millers, the lumbermen and the textile manufacturers for the available water powers.

COMPARATIVE DATA.

Differing records of the data of development of a given water power sometimes vary, and yet the date affixed may generally be true. Some of the water powers have had backsets financially and transfers of ownership and renewed efforts of development before industrial works were well established about them, and, furthermore, historical records relating to the earlier powers are often obscure and wanting in precision.

The statements of minimum power above reported from the several streams are not reduced to a uniform basis, but are dependent to some extent upon methods of the use of the power and upon artificial storage.

Pulp, paper and flouring mills, and some electrical process works, usually make twenty-four-hour daily runs for six or seven days each week, and thus allow little opportunity for daily storage of water at the dam adjoining the power plant. Textile plants now rarely run more than an average of ten hours per day, and if the storage at their dam is capacious, there is reduced wastage of the night flow of water in the season of low flow and increased available power per unit of watershed. Some streams have large natural lake storage that make more even the flow through the seasons, as the Merrimac, the Fox and several large rivers of Maine. Some plants have at their dams ponds that can store the twenty-four-hour flow in low times for twelve hours' use, thus doubling the efficiency of the stream, as at Austin, Tex., and Helena, Mont.

There are also meteorological, topographical and geological influences which are of importance, and would be here treated if space could be spared.

The methods of developments of the various powers above referred to, from the historical point of view, were influenced not only by the product to be manufactured but at the respective times, and especially before the stimulus of the war of 1812, by the financial ability of the builder, and to some degree by the state of the mechanic arts at the respective dates, and again by the kind of water wheel available at the time. The discussion of the evolution of American water wheels might well occupy the full lecture hour.

LARGER POWER ENTERPRISES.

The commercial depression from 1815 to 1820 was a trying time for many of the small manufacturers. In 1821 prospects were brightening, and Mr. Lowell, above mentioned, desired, with his associates, to erect a new mill larger than their Waltham mill. After an examination of several water powers they decided, in 1821, to purchase the Pawtucket Locks and Canal and thus secure the great water power of Pawtucket Falls, in the Merrimac River, in Massachusetts. In 1822 the Merrimac Manufacturing Company was incorporated, on February 5, with $600,000 capital stock. Then was inaugurated the beginning of the great industrial enterprises of the city of Lowell, Mass.

Thereafter, important water privileges were secured and important manufacturing companies were incorporated in such numbers, previous to the civil war, and then since the civil war, that our space permits cataloguing only those that have notably enhanced the industrial advance of America:

TABLE OF WATER POWERS AS REPORTED.
1822 TO 1861.

	Year.	Fall, ft.	Minn. H. P.	Sq. mi. watershed.
Lowell, Mass.	1822	35	11,845	4,083
Nashua, N. H.	1823	36	1,200	516
Cohoes, N. Y.	1826	104	9,450	3,490
Norwich, Conn.	1828	16	700	1,240
Augusta, Me.	1834	17	3,500	5,907
Manc'ter, N. H.	1835	52	12,000	2,839
Hooksett, N. H.	1841	14	1,800	2,791
Lawrence, Mass.	1845	30	11,000	4,625
Augusta, Ga.	1847	50	8,500	8,830
Holyoke, Mass.	1848	50	14,000	8,000
Lewiston, Me.	1849	50	11,900	3,200
Columbus, Ga.	1850	25	10,000	14,900
Rochester, N. Y.	1856	236	8,000	2,474
St. Anthony Falls, Minn.	1857	50	15,500	19,736
Niagara, N. Y. (Hy. Canal)	1861	90	15,000	271,000

TABLE OF WATER POWERS AS REPORTED.
1861 TO 1898.

	Year.	Fall. ft.	Minn. H.P.	Sq. mi. watershed.
Turner's Falls, Conn	1866	35	10,000	6,000
Fox River, Wis.	1866	185	..	6,449
Birmingham, Ct.	1870	22	1,000	2,000
Bangor, Me.	1876	9	1,767	7,200
Augusta, Ga.	1876	50	8,500	6,830
Palmer's Falls, N. Y.	1882	30	1,125	2,650
Mechanicsville, N. Y.	1882	20	3,636	4,476
St. Cloud, Minn.	1885	14	4,500	13,250
Little Falls, Minn	1887	14	4,000	11,084
Spokane, Wash.	1888	70	18,000	4,180
Howland, Me.	1888	22	6,000	..
Great Falls, Mont	1890	42	16,000	22,000
Austin, Tex.	1891	60	10,000	40,000
Sault Ste. Marie, Ont	1891	18	10,000	51,600
Folsom, Cal.	1891	55	6,200	..
Concord, N. H.	1894	13	5,000	2,350
Niagara, N. Y. (Tunnel)	1894	170	50,000	271,000
Ogden, Utah.	1896	446	2,940	360

TABLE OF WATER POWERS AS REPORTED.
1861 TO 1898.

	Year.	Fall, ft.	Minn. H.P.	Sq. mi. watershed.
Helena, Mont.	1897	32	10,000	14,900
Minneapolis, Minn	1897	18	6,000	19,737
Mechanicsville, N. Y.	1898	18	3,270	4,478

Among the small water powers not enumerated that operate important textile mills are two on the Shetucket River, in the suburb of Norwich, Conn., where the Taftville and Baltic mills are among the largest and finest mills anywhere to be found. In another suburb of Norwich, on the Yantic River, is a large and fine woolen mill, and on the Androscoggin and Fox rivers are important pulp and paper mills.

CANAL POWERS.

Soon after the opening of the present century a remarkable era of canal building was inaugurated, beginning with the Santee Canal, in South Carolina, in 1800, and including the Schuylkill, in 1816; the Erie, in 1817; the Lehigh, in 1819; the Morris and Essex, in 1825; the Miami, in 1825; the Delaware and Hudson, in 1826; the Chesapeake and Ohio, in 1828, and others. In connection with these canals and their dams numerous small water powers were developed. The doom of other proposed navigation canals was, however, sealed when the Boston and Lowell Railroad was opened in 1830, a pioneer in both passenger and merchandise transportations by rail.

The ratio of water and steam power applied to these several manufactures in 1880 is interesting, and is quoted from the census as follows:

RATIOS OF WATER AND STEAM POWERS.

	Percentage of water power.	Percentage of steam power.	Power per hand employ'd H.P.
Paper	70.70	29.30	5.07
Flouring and grist mills	60.94	39.06	13.20
Cotton goods	53.99	46.01	1.49
Woolen goods	50.33	49.67	1.23
Lumber sawed	33.91	66.09	5.56

PROMINENT CONSUMERS OF POWER.

The United States census of 1880 reported about one-quarter million horsepowers of water power in use for all manufactures at that time, and nearly double this amount of steam power then in use. The pulp and paper mills alone of America are now equipped with one-half million horse powers of turbine and engines. Our partial list, given above, of new water power developments shows that water powers have been in continuous demand, and that some of the largest in the country have come into use since 1880.

Cotton goods, flour, lumber and paper are the prominent power consumers, and if now we call to mind the chief centres of their production, we instinctively connect the water powers of Lowell or Manchester with cotton, of Minneapolis with flour, of Holyoke with paper, of Paterson with silk

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and of Minneapolis with lumber, although in the last case the great lumber interests about the water power that started the city are rapidly moving up the river to the suburb, where cheaper piling grounds for lumber are available, and the millers are absorbing the water power.

HISTORY BUILDING.

The paper and pulp industries are in the above table seen to be next to the largest power users in proportion to the number of hands employed. These industries have made most remarkable advances in chemical processes and in bulk of product since the opening of the Civil War.

Let us illustrate the advancing evolution along the hydraulic side, in which the grinders are controlling influences, because they are chief consumers of power. Experience teaches us that a 50-inch grindstone is a convenient unit in a pulp plant. The mineralogical composition of the stones now used is such that it is not advisable to give a 50-inch stone a peripheral speed exceeding 2.880 feet per minute. The state of the art to-day would, therefore, give such a grinder about 220 revolutions per minute as its maximum speed. Such a stone, doing its best work, would require about 280 horse power.. If such a grinder were to be driven by "high-breast" water wheels, such as were standard fifty years since, the manufacturer about to build a large mill would seek for a water power site where he could excavate his canals in parallels about 15 feet apart in elevation, and would speed up the grinders by bevel gears.

In the present state of the art he will use turbine water wheels in iron cases and with iron draft tubes. His engineer will, for economy, avail himself of patterns already made by prominent wheel makers so far as such can be adapted to the local circumstances of the case in hand, and he will connect one or more grinders directly on to the prolonged turbine horizontal shaft. The engineer will prefer to construct his head race or pressure penstock and his tail race so that he can use heads greater than 15 to 18 feet.

If he can secure 30 to 32 feet effective head, then one standard turbine will drive one standard grinder at proper speed, or a pair of turbines will drive two direct-connected grinders at proper speed. If he can secure 36 to 40 feet effective head, then one turbine will drive two direct-connected grinders at proper speed. If, on the other hand, he cannot build the water power with greater than 18 to 21 feet effective head, he will place three smaller turbines direct-connected to one grinder, rather than gear or belt up the speed from a more powerful but slower revolving turbine.

Thus, the present state of the art varies the present method of water power development from the methods of the past generation, and thus each advanced stage of the art has varied from the next preceding. The recent changes in turbine settings have economized greatly in space required for water wheels and in costs of wheel pits. We shall make another material saving of room and in cost of plant when the manufacturers will permit their grinding stones to revolve in horizontal planes and place them on vertical, instead of horizontal, shafts of turbines.

LOW FLOW OF STREAMS.

We sometimes hear the statement that the streams are drying up. If this were generally true, there might come a time when pulp-making with fuel engines would successfully compete with pulp and paper making by water-power energies. We have available records of New England and Atlantic slope rainfalls covering more than two generations, and of evaporations for a considerable number of years. It does not appear by these records of precision that there has been a material diminution of rainfall. In locations where forests have been cleared, or large proportional areas drained, the rain flows off more quickly, as a rule, and the floods are thus enhanced and droughts increased in length. These are but local results from artificial causes.

When a manufacturer is to build upon a new water-power site he desires first to know from his engineer how much power he can rely upon in the season of low flow of the stream, and this has usually been a difficult question to solve.

For illustrations of the ratios of low water flows in different water power localities, we cite in the next table a few characteristic minimum flows as gathered from various sources, giving the square mile area of the watersheds referred to, and the flows, expressed for comparisons, in cubic feet per second per square mile of watershed.

Manufacturers usually proportion their machinery for the mean flow of the three or four months of low flow, which they call the ordinary low flow, and this ordinary low flow is usually two or three times as great as the flow of the week of minimum flow.

LOW FLOW OF STREAMS.

Stream.	Sq. miles of watershed.	Cu. ft. per second per sq. mile.
Androscoggin at Berlin Falls (storage)	1,480	.950
Merrimac, at Lowell	4,085	.310
Concord, at Lowell	361	.170
Sudbury, at Framingham	78	.036
Charles, at Upper Newton Falls	215	.020
Connecticut, at Hanover	3,316	.303
Housatonic, at Birmingham	1,562	.320
Croton, at Croton Lake	339	.178
Passaic, at Paterson	813	.240
Schuylkill, at Philadelphia	1,800	.160
Delaware, at Stockton	6,790	.200
Potomac, at Chain Bridge	11,161	.195
James, at Richmond	6,800	.191
Shenandoah, near Port Republic	770	.167
Ohio, near Pittsburg	18,732	.120
Illinois, at mouth	29,013	.055
Colorado, at Austin	40,000	.025
Wisconsin, at Portage	8,200	.340
Lower Fox, at outlet of lake	6,046	.380
St. Louis, at Fond du Lac	3,106	.080
Kansas, at Topeka	50,354	.035
Minnesota, at mouth	17,230	.067
Mississippi, at Minneapolis	19,736	.112
Missouri, at Great Falls	22,000	.116

These records will, perhaps, seem to the uninitiated as expressing little of law or order or unanimity, but to the engineer they express the varied influences of topography, meteorology and geology of the respective watersheds, such as he has to carefully consider and weigh before expressing his judgment on the energy capacity of a proposed new water power.

FLOOD FLOW OF STREAMS.

Another matter about which full information is desired before starting the construction of a new water power is the flood flow of the stream, so that the head works and races and mills may be properly located. The flood flow is subject to varied topographical, meteorological and climatic influences which the engineer recognizes and which control the co-efficient in whichever formula he uses as an aid in reaching a computed result.

The flood flows on a few well-known streams are given as illustrative examples gathered from various sources.

FLOOD FLOWS OF STREAMS.

Stream.	Sq. miles of watershed.	Cu. ft. per second per sq. mile.
Merrimac, at Manchester	2,838	34.12
Merrimac, at Lowell	4,085	33.41
Sudbury, at Framingham	78	41.38
Shetucket, at Greenville	1,200	41.29
Connecticut, at Hartford	10,234	20.27
Westfield, at Simon Falls	340	151.
Croton, at Croton Lake	339	74.87
Raritan, at Bound Brook	879	59.16
Rockaway, at Dover	52	43.10
Passaic, at Little Falls	773	24.72
Chemung, at Elmira	2,055	84.75
Genesee, at Mount Morris	1,060	32.02
Neshaminy, below forks	152	34.91
Delaware, at Lambertville	6,500	53.85
Potomac, at Chain Bridge	11,161	42.49
St. Louis, at Fond du Lac	3,106	5.47
Mississippi, at Minneapolis	19,736	3.04
Missouri, at Great Falls	22,000	2.35

Just at the time of the present writing we seem to be upon the threshold of a promising term of industrial activity in America, and the frequent requests for information about new water powers indicates that water powers are still to maintain their prominence in the developments of the manufacturing interests of an expanding nation, that even now sends the productions of its skilled artisans to markets among the shops of foreign competitors that heretofore boasted their world-wide supremacy.

A BROADENED FIELD FOR POWER.

Water powers are not usually found along the path of commerce. The water privileges were sought for, and as they were constructed the railways went to them, as at Lowell and Manchester, on the Merrimac, in the early days, and Great Falls, on the Missouri, in recent days.

Recent perfections of various electrical generators, transmissions and motors have begun now to change the relative advantages of position, for the energies of the falling waters may now be wired to the localities where they can be used most advantageously and profitably.

Until recently a mile or more of head-race, or parallel races, was thought necessary for the development of a 10,000-horse-power water privilege, as on the Merrimac and Connecticut river large powers. The modern use of penstocks, conducting the water under pressure, and the use of high-speed turbines and direct-connected machines or electrical generators, permits the development of a like large water power in a single power house of moderate proportions, and now, with the aids of modern transmissions, the developed power may be distributed to accessible and convenient sites for the locations of mills and to numerous motors, each attached to its individual machine, where and as may be convenient.

Thus is beginning a new era in the use of water power, in the bringing of powers heretofore inconveniently located into availability, and thus is beginning a new chapter in the history of successful water power developments that will apparently be more momentous than the works so hastily reviewed.

Industrial Betterment.

SYLLABUS OF LECTURE BY DR. WILLIAM H. TOLMAN.

Dr. William H. Tolman, secretary of the League for Social Science, said that he had been studying factory systems to learn what was being done toward the comfort and improvement of the employees as regards wages, hours and social conditions. There are some instances where the employee is reduced to an animal, and, like an animal, is supposed to require enough only to keep him alive. In such cases man becomes a machine, the only difference being that there is blood instead of steam.

Taking another view of the situation, the employer has the opportunity of conferring a blessing not only upon those who work for him but further than that—upon their home and the community at large. He also benefits himself by raising the standard of those who work for him, which gives better workmanship, more attention to duties, and more success to his enterprise in the end.

Such conditions as the latter were shown to exist in the great factory of the Cash Register concern. This enterprise, like many others, had a small beginning. It became known to the proprietor that the men in his employ were careless of his time and material, and, after thinking the matter over, he decided to demonstrate to the men, by a series of lectures in which stereopticon pictures were used, that what were his interests were also theirs. These object lessons had a good effect; and as the business grew in size, new and larger factories were erected, until at present the works are contained in a handsome, large building, in which about 1,500 operatives are employed. By constantly providing those things which tend to improve the conditions of the operatives the proprietor eventually developed a superior working force of men and women, and what was at one time styled "Patterson's Penitentiary" is now known as "Patterson's Paradise."

In the beginning everything rested upon the head of the firm, but with the improvement came men in every department who could be depended upon to do their work well, and the old condition of the entire responsibility resting upon one man was reversed, so that it was divided up among many men, who were able to carry out their part. From the workingmen were selected five of the best, who were constituted the factory committee, and this committee has full charge of the making part of the factory. They can hire or discharge whomsoever they deem best, and in this they are upheld by the firm.

It was found that retaining one man at the head of the making department permanently resulted in favoritism and unsatisfactory management, so the plan was devised of allowing each of the five men of the factory committee to have charge for a certain period, and this plan has worked successfully, as the other members of the committee harmonized with the one in charge, and everything has gone on smoothly. With control of the different departments of the great concern divided among various men who had been tried and found capable, the business has progressed.

The girls in the factory, of which there are many, are permitted to come an hour later in the morning than the men, and they are dismissed a quarter of an hour before them, so that they are not compelled to ride on the back platform of the street cars on their way home. On arriving in the morning the girls are allowed to ride on the elevator to the floor upon which they are engaged, instead of trudging up the stairs, as formerly. At noon they are supplied with a good, substantial meal at the expense of the proprietor, in a large and handsomely fitted dining room, which is decorated with palms, and has in connection a music room and a retiring room, where medical attention can be had and where the girls can rest. This they are encouraged to do if they feel indisposed. They have bath rooms also. In their work they have chairs with comfortable backs.

The men also have shower baths, club rooms, class rooms and libraries in the factory, and elsewhere, provided by the proprietor. Enough time to take a good shower bath is allowed to each man once a week.

Another novel feature of the factory is the premium offered the employees for the best suggestion of idea in connection with the factory or the work that is being done in it. The men write their ideas on a duplicating machine, which is provided in each room, and a copy is kept by the one making the suggestion. Many good ideas are secured by the proprietor in this way, and one simple little suggestion bearing upon a different method of filing a certain part of the mechanism has almost revolutionized the cash register. Suggestions on any matter may be sent in to the heads of the concern, and they are duly considered. Many of them are made use of and carried out, so the men feel that they are a useful part of the enterprise, rather than merely hired servants.

Ideas on decoration have been adopted, and now the grounds about the factory are beautified by superb plants, vines and flowers, growing close to the sides, covering the walls, and sending their fragrance in through the windows. In the work rooms also are arranged handsome palms and other plants, and the homes of some of the factory hands, that are close to the place, have been decorated by the growing of plants and vines, making the scene picturesque and inviting.

The musically inclined men of the factory have organized a band, which comes in for a hearing at the various events. The men have their smokers, and fraternize in an enjoyable manner; the girls also have many festive occasions. A kindergarten, cooking school and classes for the children and young girls of the various families represented in the factory are maintained, and prizes are offered for the best endeavors in different lines of work.

All this is done for the social improvement of the men and girls employed in the factory; it costs the proprietor a large sum of money, but it pays, in the end, in the kind of work turned out, the character of the employees, and the goodwill and brotherly love spread abroad.

By way of comparison, views were shown of what the Van Markens, of Delft, Krupp, of Germany, the Levers of Port Sunlight, England, and the Cadbury Brothers, of England, were doing for the comfort and convenience of their employees. The philosophy of Richard Cadbury, who wrote regarding their work, is typical when he said: "We find that nothing pays us better than looking after the comfort of our employees, and certainly nothing gives so much zest to life than to see so many happy about us. The manufacturer has a great opportunity of adding a blessing or a curse to the homestead, where father, mother and children all participate in the plans and regulations made in the factory."

The Father of Modern Paper Making.

BY COLIN K. URQUHART.

Nicolas Louis Robert, to whose genius the world is indebted not only for the idea of making paper by machinery but also for the paper machine itself, was a Frenchman. He was born in Paris, December 2, 1761. As a boy he was of a serious and thoughtful turn of mind, and his general bearing is perhaps indicated by the nickname of "The Philosopher," which was bestowed on him by his schoolmates. He also possessed a spirit of adventure and independence, which is shown by the fact that at the age of fifteen he quietly took his departure from home, and, going to Nevers, endeavored to enlist in a regiment stationed there, and only failed because he was neither old enough nor tall enough to meet the regimental requirements. He was consequently rejected by the military authorities and sent back to his parents.

He began his business life as a notary, but the occupation was not to his liking. He desired to enter upon a military career, and finally his parents, who had meantime met with financial reverses, yielded to his persistent requests, and on April 2, 1780, he was enlisted in the Grenoble Artillery, a battalion of which was then stationed at Calais. The War of Independence was then on, and fifteen months after his enlistment Robert was drafted into a detachment of artillery which was sent to America. Military life did not present the opportunities for advancement which he had hoped for, and on the return of his detachment to France Robert applied for his discharge. His request was granted, and the discharge contained expressions of a decidedly complimentary character, which Robert had earned by distinguishing himself in a number of engagements in which he had taken an active part.

In 1793 or 1794 Robert became a proof-reader in the employ of M. Pierre Didot, a printer. He conducted himself well in his new position, winning the confidence and esteem of his employer to such an extent that when M. St. Leger Didot, a son of M. Pierre Didot, was casting about for a manager for his paper mill at Essonnes, Didot senior recommended the faithful proof-reader as a proper person for the position. The recommendation was adopted, and Robert entered upon his duties as the manager of a paper mill employing 300 hands.

Soon after the beginning of his connection with the mill, Robert conceived the idea of making paper in continuous sheets and by machine. After considerable preliminary work he put his idea into substantial shape and constructed a model machine, which, however, did not meet his expectations. Instead of discouraging him, the failure seems to have acted as a stimulus, and he gave all his spare time to the solution of the problem which he had set before himself. As his own means were limited, he sought to interest his employer in his plans, and, although Didot was very skeptical as to the outcome of the work, he recognized the immense advantage to be gained from a paper-making machine could one be constructed, and finally he agreed to advance a reasonable amount of money and to place his mill at Robert's disposal in order that the experimental work might be carried on. Some five years were consumed in experiments, and at the end of that time there was constructed a model which apparently satisfied not only Robert, but his employer, Didot. The next step was to construct a large machine capable of making paper on the lines laid down in the model. This was done, and the result, looked at in the light of our modern, high-speed, wide machines, is certainly very crude.

The machine consisted of an endless band of copper-wire gauze, which was stretched over two rollers, one of which was fixed in a frame over a tub, which contained the beaten stuff, while the other was movable so that it could be adjusted to take up any slack in the wire. In its traveling the cloth passed between two adjustable squeeze rolls, located just above the edge of the tub, and by which there was removed sufficient water to allow the paper to be reeled upon another roll located between the squeeze rolls and the adjustable wire rope. The pulp was conveyed to the moving wire by means of a drum, equipped with fans. This drum seems to have done double duty, being both an agitator and a device by which the pulp was lifted and regularly delivered on the wire. The wire was given a lateral "shake," and was also filled with a crude device to regulate the width of the sheet. When the roll which received the paper from the wire was filled the paper was unrolled from it and was then ready for the drying loft.

There having been constructed a machine which actually made paper, the next step was to obtain a patent for it, and at this point trouble arose. The cost of obtaining the patent was £30. Robert was utterly unable to meet the expense, and his employer, who had stood by him through all the years until he was able to demonstrate his idea in practical working shape, either could not or would not render any further assistance. In his dilemma Robert, on September 7, 1797, applied to the Minister of the Interior for relief. He pointed out that he had invented a machine by which he was able to make paper in sheets 40 or 50 feet in length without the assistance of any other workman. He asked that the Government fees be remitted, and that he be granted a patent for fifteen years. He added that if it was impossible to remit the fees, that the Government appoint a commission of experts to examine the machine, and if they were satisfied that the machine was as it was represented that then the Minister recommend Robert as a person worthy of national encouragement. The Minister replied that he could not remit the fees, but that he would adopt the suggestion of Robert relative to the appointment of a commission. The commission was appointed, and, basing his action upon its report, the Minister recommended that Government assistance be given to the petitioner.

Later Robert was granted £120, and it was probably out of this money that the inventor paid for his patent, which was issued to him January, 1798.

Here fresh trouble arose, and an English writer, referring to it, says: "Robert, it appears, had agreed to dispose of his patent rights to Didot, and the difficulty was with regard to the price that should be paid for them; the parties could not agree and an action-at-law was the result. In the end the decision was in favor of Robert, who obtained a decree for the restitution of the model machine constructed at the expense of Didot, and which the latter had since kept in his possession. While the case was passing through the courts Robert seems to have conceived the idea of setting up a paper-making establishment of his own, where he could manufacture paper by means of the new machine, and he accordingly took premises at Darnetal, near Rouen; but this arrangement did not hold good for long, as his resources failing him, Robert was compelled to close the place. When his case against Didot was decided he returned to Paris, and a reconciliation between him and the former gentleman seems to have shortly afterward taken place, an agreement being come to in the spring of 1798 whereby Robert agreed to assign his patent to Didot and to deliver to him a new machine, as well as a full-size model of some new mechanical attachment which he had lately devised with a view of further extending the continuous sheets of paper, as well as to teach him certain important processes for paper sizing, which he had recently invented. The price fixed for these various concessions was £1,096, of which, however, less than £100 appears to have been paid in cash, the balance being retained as a loan from Robert to Didot, on which the latter paid him interest annually out of the profits he received from his mill at Essonnes. Matters between himself and his old patron being thus satisfactorily settled, a further agreement was shortly afterward entered into, in which Robert agreed to direct for a period of three months the paper mill at Essonnes, during the absence for that time of M. Didot, who wished to go to England with a view of exploiting there the patent rights which had been transferred to him by Robert in terms of the agreement first mentioned."

Didot and his brother-in-law, John Gamble, did exploit the machine in England, the latter named taking out a patent for a paper-making machine in his own name, and later forming a connection with Henry and Sealy Fourdrinier, after whom the machine was named, and who ruined themselves financially in promoting its interests.

Robert continued to operate Didot's mill until the latter became embarrassed financially, and the mill was sold to pay the debts. Then began a series of misfortunes which culminated shortly after 1814, when his patent expired. He finally quit the paper-making business, and for some years he conducted a private school near Dreux. He died on August 8, 1828, and after his death there is practically no record of what became of the machines which were constructed on the lines laid down by him.

The McEwan Patent Sustained.

The case of the McEwan Brothers Company *v.* William W. McEwan, George W. Downs, Matthias Plum and Matthias Plum, Jr., for infringement of complainant's patent, No. 492,927, covering an improvement in paper board, was decided in the United States District Court in New Jersey, February 11, and a decree for an injunction and an accounting ordered to issue as prayed for.

It appears that at the hearing the defendants did not deny the charge of infringement, but contended that there was non-invention, lack of novelty and anticipation.

"Numerous instances," says the Court in its opinion, "of prior use and other anticipatory matter, including divers process patents, are alleged in the answer * * * * and among the exhibits are several specimens of paper board claimed to anticipate the complainant's product. * * * I am not satisfied that the defendants have shown anticipation. A mere preponderance of evidence cannot * * * avail the defendants. * * * The question of anticipation or lack of novelty not being free from doubt, the success with which the complainant's product has met, has weight in turning the scale in favor of the invention."

Elsewhere in its opinion the Court said that "the patent in suit is for a product and not for a process. * * * The complainant does not use * * either bleaching powder or size. There is no chemical destruction of the printer's ink. There is merely mechanical disintegration."

The Court refused to entertain the defendant's contention that the words "permanent particles of ink," as used in the complainant's claim, included its oily constituent, and that while the patent excluded the use of bleaching powder, it contemplated the use of alkaline size, and said that if the first contention was so, the validity of the patent might well be questioned, but held that the claim "if fairly susceptible of two meanings, that construction is to be adopted which will sustain rather than defeat the patent."

Annual Elections.

At the recent annual election of the Kalamazoo (Mich.) Paper Company the following officers and directors were elected: President, S. A. Gibson; vice-president, E. Woodbury; secretary, F. M. Hodge; treasurer, Edward Woodbury. The directors re-elected were the above officers and G. L. Gilkey, C. G. Kleinstueck and E. C. Parsons. The directors have elected F. M. Hodge as president to fill the vacancy caused by the death of S. A. Gibson.

CHAS. M. JARVIS, PRESIDENT. GEO. H. SAGE, SECRETARY. F. L. WILCOX, TREASURER.

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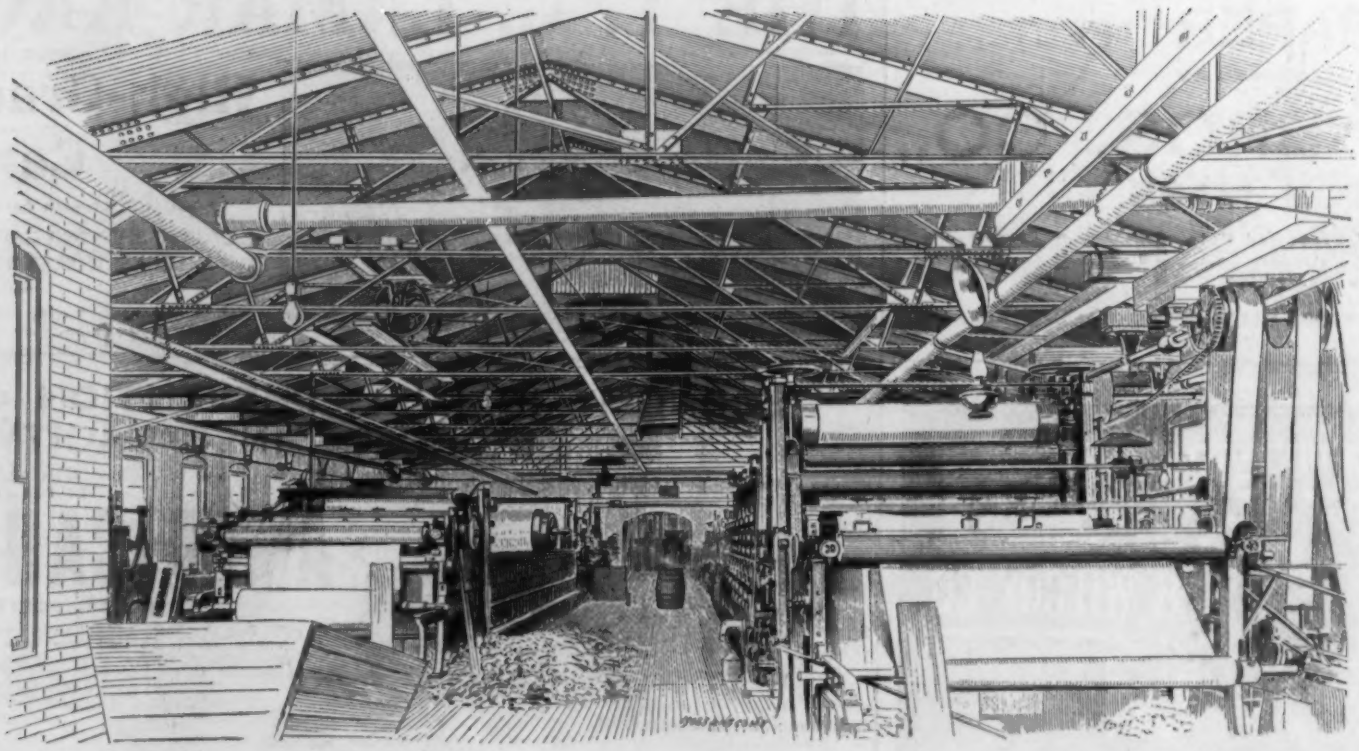

The above illustration is taken direct from a photograph showing the interior of the Machine Room of the Lake George Pulp and Paper Company at Ticonderoga, N. Y. The roof trusses shown in the illustration were designed and built by us. The Machine Room is 58 ft. in width and 125 ft. in length.

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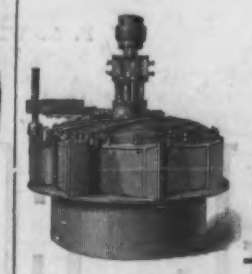

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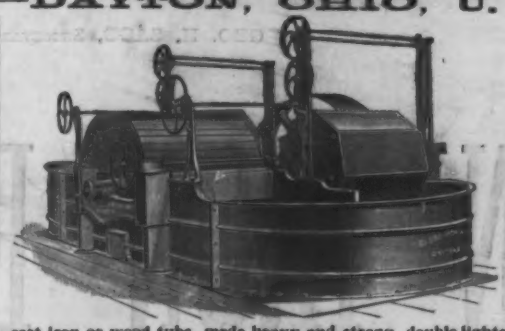

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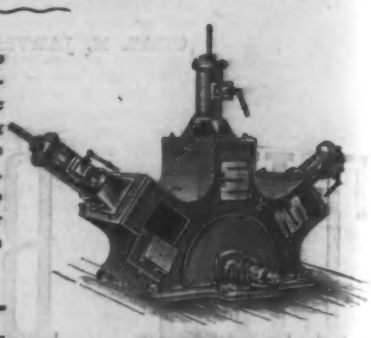

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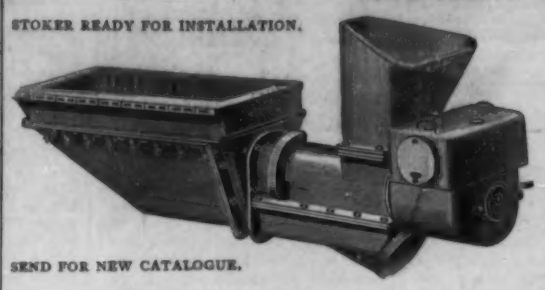

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7—B. 2-12-99.

THE BANQUET.

(*Continued from page 130*)

ty years. It is being urged by the American Newspaper Publishers' Association, at whose banquet in this hall to-morrow night I will probably have to take their side of the question, that the exhaustion of our forest suppply can only be postponed by the free admission of Canadian paper and pulp, but such an effort would likely be brought to naught by the imposition of an export tax by the Canadian government, which to-day the press of the Dominion is demanding for the protection of their own forests. Unfortunately, the vast amount of territory in the Adirondacks now owned by the State, amounting to over one million acres, in consequence of the present constitutional prohibition against the cutting of timber on State land, is not available for the benefit of manufacturers, or for the financial good of the State, and cannot be made available until the present constitution is amended or a new constitution adopted fifteen years from now.

This constitutional restriction is in direct conflict with the interests of the State and of this great industry of yours. The permitting of mature trees to die and rot, when they might be utilized under proper management, is like maintaining an apple orchard and prohibiting the gathering of the ripened fruit. While the conditions which existed at the time of the last constitutional convention may have justified the enactment of this sweeping provision, it may be seriously considered if the time has not been reached when it should be modified in view of the fact that lumbering, in which you are so deeply interested, is now being conducted with intelligence and with a view to the future supply. This association could do no better work than to properly present an amendment of the constitution in this respect to the intelligent judgment of the taxpayers and voters of the State.

It is obvious, from these points, that the greatest encouragement should be given to the efforts which we are putting forth to inaugurate and successfully carry on a comprehensive system of forest cultivation, through the necessarily indirect course of vesting in Cornell University the title to 30,000 acres of forest lands which the Forest Preserve Board has just purchased for a practical trial of farming and cropping timber.

Few people, even the lumbermen themselves, are aware of the immense value of the annual forest product of the United States. It is greater than the combined value of our gold, silver, coal and iron. Trees, in some form, have always entered into most of our daily wants—our houses, barns, furniture, fences, fuel, and into a thousand other uses. Through all our lives the forest product in some way forms the Alpha and Omega of our wants, furnishing, indeed, the material from which are made both the cradle and the coffin. And now we have its recent, wondrous and universal application in the industries represented here to-night, for in the newspaper, the book and the magazine we find it everywhere. You are all familiar with that beautiful story in mythology of the dryads and wood nymphs whose spirit life was imprisoned in the trees, to be released only by the woodman's axe. Then, the tree fell and the mirthful voices of mischief were everywhere heard in wood and dale. Now, the tree falls, releasing another spirit, which, through paper sheet and printed page, is heard throughout the world.

However great or cheap may be the supply of our raw material, our mills cannot compete successfully with those in the other states of the Union without an adequate, permanent and continuous supply of water power. To that end, the wooded slopes about the sources of our streams and rivers must be protected from denudation. We have been coming more and more to a realization of the necessity of preserving unimpaired the storage capacity of the woodland reservoirs that deliver the water to these streams. Not only the industries in which we are engaged, but the navigation of our canals and water-ways are, to a great extent, dependent upon this supply, and now that the transmission of electric force to distant points has become an established fact, we must remember that the waters of these rivers and streams will not only run street cars in Buffalo, Rochester, Utica and other cities of the State, but will also, when the improvement of the canals shall have been completed, propel the boats that travel our commercial water-ways. Only a few years ago we were startled by the announcement that the power of Niagara Falls was to be transmitted to the city of Buffalo, but almost before the sensation caused by the thought of such a possibility had abated, Niagara was absolutely in chains and her power infused into the arteries of a city 22 miles distant and operating a gigantic pulp and paper mill on the way. Indeed, below the mill in which I am interested at Mechanicville, a dam has just been built across the Hudson River for the purpose of generating and transmitting electric power to operate the works of the General Electric Company at Schenectady, where electric appliances of every kind are now being built for use not only at home but abroad. Talk about carrying coals to Newcastle! Yankee ingenuity and industry have carried us beyond that; for we have even substituted in Great Britain itself, for the power generated by the coal of Newcastle, electric motors made in the Empire State of the Union.

The forest preserve board of the State, to which I have already alluded, has taken a lively interest in the question of the protection of our natural water-ways and the increase of their volume by artificial means. We have just completed a storage reservoir at the head of the Indian River, one of the tributaries of the Hudson, which will contain 4,500,000,000 cubic feet, and will effectually supplement the low water in the river during the dry season. An addition of two or three more such reservoirs, which can be constructed without large expenditure, will ensure an adequate supply of water power to all these mills under conditions as unfavorable as any which have heretofore existed. How important this water-storage question becomes in the light of the use of our water power for the generation of electricity! May it not be that the closing years of the nineteenth century have seen only the first steps in the application of electric power; and that these great water-power developments are but the precursors of others which will operate practically all the manufactures of the State, and perhaps even the surface, elevated and future underground railways of this imperial city at the mouth of the Hudson.

To-day the electrical power used in the commerce of most of our cities is generated at a large expense for fuel. It is apparent that just as soon as the inventive genius of the American people has solved the problem of conducting electricity long distances without serious loss, we may expect to save the great expense of the present methods of generation by the substitution therefor of the abundant water power which we have allowed to flow past us without a thorough realization of its usefulness.

Not many years ago, within the recollection of all of us, there was a common belief that the end of the world would be coincident with the exhaustion of the supply of wood and coal, and the date was confidently computed. This was even before the manufacture of wood pulp became the great factor that it has in decreasing the timber supply. But Mother Nature in the plentitude of her bounty meets each new want with new resources. The evolution of natural forces must, however, be supplemented by the operations of mankind, and, therefore, it behooves those who are interested in the welfare of a great commonwealth like ours to be always alert to profit by the benefits which nature has bestowed.

The efforts of our Forest Preserve Board to preserve the forests and conserve the water supply has not been confined, of course, to the watersheds of the Hudson. The strong protecting arm of the State has been extended over our entire nothern area, so that all the rivers and streams which rise in the shaded seclusion of those mountain slopes might be preserved with an undiminished flow. The combined power of these rivers rivals the power of the falls of Niagara; and what is more, these streams radiate in every direction, from a common mountain centre, so that the electric force which they are capable of generating can be transmitted even with existing conductive appliances to numerous industrial centres of the State, and doubtless in time, as I have before suggested, to every part of the great commonwealth. Then all will feel new life and impulse from the exploitation of this new factor in our political economy.

The benefits to be derived from forest preservation, such as the conservation of moisture, climatic influences, sanitary benefits and future timber supply have been the theme of many speakers and the thought of many people. But now, with the birth of an electric age, we may add the innumerable benefits from the mighty but latent energy soon to be evolved into life and motion—that great motive power which, under the fostering influences of invention, is destined to turn all the wheels of industry, operate railroads and canals, and, by furnishing light and warmth to our homes, increase our domestic happiness, and thus make life better worth the living. [Applause.]

The President—The next toast is "Things Settled and Unsettled by Our War with Spain," and will be responded to by a statesman and orator who had the courage of his convictions and became one of the first to lead in bringing about the much desired reconciliation betwen the two sections of our common country. I have the honor and pleasure of introducing to you the Hon. John S. Wise.

RESPONSE OF HON. JOHN S. WISE.

Gentlemen—As I have listened with attention to-night, I find the true secret of the very habitual motion in Congress of giving speakers leave to print. It has a shrewd turn of business in it, which consumes your product instead of wasting your time in listening to what people have to say.

To talk about what has been settled, and what has been and is unsettled opens a great field, but I know how I shall approach it, because when I was invited here I was told that two sensible, prosy speakers were going to precede me [Laughter], and what was wanted of me was to stir you up. Now, I am in for that. I did not come here to deliver a funeral address on anybody, and I heartily concur, at a banquet where we have had such good wine, in the recommendation of the Lieutenant-Governor—Damn the water! [Laughter.]

What has been settled by the Spanish war. It began by settling the Maine in 20 feet of water. It has been settled with marvelous rapidity in this country that because a man was rich he was not a coward. [Applause.] It has been settled that as a soldier William Jennings Bryan will go to join the silver issue. [Laughter.] It has been settled that we have settled Cuba, although we did not want to. It is settled that the only place we really do want is the place that we say we do not want, and the place we don't want we don't know whether we do want or not. [Laughter.] It has been settled that, while it was said two years ago, "Woe to the land to hastening ills a prey, where wealth accumulates and men decay"; it has been settled that those decayed men did most of the fighting and upholding of the standard of the country. [Applause.] We were told that the bone and sinew of this land would save it when the emergencies came on, which bone and sinew was the man that was talking [laughter], and when the fight did come on the first ship that appeared, poking his saucy little nose into the very faces of the Dons, was that furnished by an effete millionaire, and the first blood which was shed gallantly in the forefront was the best blood of the best people of the Empire State. [Applause.] When it came to charity Helen Gould was the woman whose name will be remembered through all generations. [Applause and cheers.]

Now, these things have been settled. The bill for it all has not yet been settled. [Laughter.] Some things are unsettled still, and I cannot help suspecting that the reason why they are not settled grows out of the innate tendency of an Ohio man when he once gets his hand on a thing never to put it down under any circumstances. [Laughter.] It is yet a problem whether we are humanitarians or not. We have gone into this controversy with high and lofty sentiments, but it is still unsettled whether we possess those sentiments because we utter them. Sometimes, the way this thing is going on, when I hear of the good that we are doing to suffering humanity, I cannot help thinking of the story of the hog that got through a neighbor's fence into his cornfield, and, while he is chewing husks and poking his nose through husks, he says he is doing it for the good of the farmer. [Laughter.] It is yet unsettled how we are to deal with this chocolate proposition [laughter] with which we are confronted.

The question in my own mind is whether George Washington or Mark Hanna had the most correct impressions as to the true scope and destiny of the United States. [Laughter]. That is unsettled. The questions for the future are whether we are ready to take in 8,000,000 people, Mongolians, Chinese and the Lord know what, including about 200,000 people suspected of cannibalism, and to make them citizens of the United States in view of the fact that we have not yet regulated the negro problem in the United States. [Applause].

There are other questions settled. It is settled that Teddy Roosevelt can vote and Tim Woodruff can run. [Laughter and applause]. There are unsettled questions. There is one body of braves in the service between whom and their officers there is an unsettled conflict. It reminds me, when I look it over, of the case of the old darky who went fishing in Virginia, and went to sleep with his fishline tied to his toe. A big drum-fish struck his line and upset the boat, and the darky and the fish were both

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drowned. In a week they floated ashore, bloated and thrown up by the tide, and the neighbors came down and looked them over, and one of the wags wrote this epitaph:

"The neighbors never could make out
In spite of all their figuring,
Whether the nigger afishing had gone,
Or the fish had gone aniggering."
[Laughter].

It is unsettled, as the result of the Spanish war, how much it will cost the United States for the luxury of bestowing civilization upon people who have to be shot to administer it. It is uncertain whether, if we get them down and sit upon them, we can leave them without leaving a good-sized fleet and a reasonably good-sized army. And it is still unsettled how in thunder we are to have the army if Congress won't pass the Army bill.

Now, my fellow-citizens, the art of post-prandial speaking is to give your audience just enough to think about. Thank Heaven! Saturday is near at hand, and following it is Sunday. If you take the problems which this brief speech have suggested, let us come back next year, and maybe some of these things will be settled. [Prolonged applause].

W. H. Parsons—Mr. President, will you allow me to interrupt the proceedings by submitting a report from a committee which was appointed this afternoon, and as it related to the officers of this association, and they might feel some delicacy in putting the question, I am going to ask my friend, ex-President Paine, who is not noted for his modesty [laughter] to put the question:

"Whereas, The term of office of Hugh J. Chisholm, Esq., as president, and Chester W. Lyman, Esq., as secretary and treasurer of the American Paper and Pulp Association, expires with this meeting,

Resolved, That we express our appreciation of the services which these gentlemen have rendered to the association as officers and for their painstaking labor.

Resolved, That the arrangements made for the last two annual meetings have been such as to commend themselves to the association. We have been greatly interested and instructed by the papers which have been presented and read, and realize that the securing the gentlemen who are qualified to prepare and read such papers was attended with great effort and labor, the result of which has done much to elevate the standard of our meetings, and has been of very great benefit to all the members of this association. [Laughter.]

Resolved, That while we express the greatest loyalty to their successors, we shall always remember with great interest the work of the association during the past two years under their administration.

(Signed) Warner Miller,
Wellington Smith,
H. E. Rogers,
W. H. Parsons,
Committee.

Colonel Paine—Gentlemen, you have the report of this committee and the resolutions they have presented, offered by our modest ex-president, Mr. Parsons. Are they seconded?

The resolutions were seconded by several members, and adopted by a rising vote, amidst applause and cheers.

Colonel Paine—The resolutions are unanimously adopted.

The President—Gentlemen, our next toast is "Consolidation," and it will be responded to by one who has received the highest honor that a state can bestow upon one of her sons, and whose name to-day stands forth as the great leading financial power in many centres of our country. I have the honor and pleasure of introducing to you the Hon. Roswell P. Flower. [Applause.]

The president then introduced Roswell P. Flower, who responded to the toast "Consolidation" as follows:

Mr. President and Brother Paper Makers, Ladies and Gentlemen—I am very glad to be here to-night. I know from my experience that it is only once in a year that you can come to New York and afford a dinner like this. I was glad to hear Brother Reid say that he was mistaken, and owned it up. I was glad to hear Lieut.-Gov. Woodruff talk so ably in regard to the forests of the State and the waterways of the State. I had some experience while I was Governor in preserving the vast Adirondack region. I thought I knew something about forestry, and I believed, as he does now, that the State made a great mistake when they voted not to sell one dollar's worth of woodland outside the Adirondack region, but to buy the Adirondacks in time; not to allow one stick of timber to be cut inside of that region on our State lands. The State lands that the State of New York owns to-day—between 500,000 and 600,000 acres—would have bought two-thirds of the 3,000,000 acres in the Adirondack forests. They ought to have been sold, but the people voted otherwise, and we had to obey. They voted that there should not be a stick of timber cut on the lands belonging to the State in the Adirondack region. There is where they made a mistake, because those woodlands, properly cut over with brush piled to avoid fires—cut every twenty years, as fields are cut every year, would produce a great source of revenue to the State, as I have no doubt they will under the able administration of the Forestry Commission now. The people also voted to spend $9,000,000 in deepening the Erie Canal. Well, if Gov. Roosevelt and Lieut-Gov. Woodruff will take the trouble, as I did when I was Governor, to go through the Erie Canal, they will find that there is 6½ feet of water from Buffalo to Albany, and that between Tonawanda and Buffalo there is an electric cable line supplied by power from the power station at Niagara Falls that without the displacement of any water can haul a canal boat at double the present speed and at about one-half the cost, making the canal that is said to be too small for commerce, and has not one-third of its capacity in use to-day, six times the capacity it has at present by the simple means of the use of that electric power, thus giving to every man a chance to hitch his boat onto it at one-half the cost of hauling his boat by horses and mules. [Applause.]

I heard Gov. Wise tell a fish story, and I am tempted to tell one myself, although I am not quite as unsettled on these great questions of the country as people generally seem to be. I believe in keeping what we have got and making the best of it. [Applause.] Not that we should make these people our equals, but they have been thrown into our hands through the providence of God; we won them, and, while we do not want to mix up or amalgamate with them, I believe in keeping them and trying to help them to work out their destiny, so that they can have, as we have, a government for and by the people—just as good a government as they can possibly make, and our soldiers will teach them to whistle "Yankee Doodle" before we get done with them. [Applause.]

We will teach them what liberty is, regulated by law. We do not mean to make them conquered subjects, but we mean to make them equals in their country; not equals with us, because it will take years to do that, but we do not want to give them up. Let us work out that problem. But this fish story that Gov. Wise told reminds me of one told by Bishop Whipple, of Minnesota, to me a number of years ago. A good, old fellow was always fishing and telling good stories, and he was not a colored man. The Bishop said that the old fellow fell into a creek one day. Well, they pulled him out and buried him, and along came some comrades, and they gave him this epitaph:

"All day he angled by the prattling brook,
He lied about the fish he took,
And now he lies here still." [Laughter.]

I wish that your president had given me some other toast that you do not know more about than I do—consolidation or evolution in business methods. I can go back, as many of you here can, as far as fifty years. I remember of my mother taking a week to knit a pair of stockings. What did it cost for her labor, do you suppose? Why, she did not make two cents a day at it. I remember when there was a hand loom in nearly every farm house in the northern part of the State of New York. I remember when rag carpets were in vogue. I remember when they used to card wool, and I used to go take a hand in the carding myself on my father's machine. I remember when I could swing a scythe or take a hand cradle. The stumps were sometimes in the fields then, but we have got done with that now. In the hay fields it was not an uncommon thing to see a dozen or fifteen men trying to cut each other out on the swath all the way through. Now, you have the mowing machine, the reaper, the raker and binder, all those things, and one man or two men do the work of twenty.

What became of all the people who used to make these stockings? The girls used to be busy at it. Why, when you were married, my friend. (President Chisholm), your wife made you the first shirt, and although it fitted like a yoke, you swore it was the best fitting shirt you had in your life. All this has gone—where? It has gone into the factory. Your knit goods, your underwear, your shirts, your stockings, everything that you wear has gone into the factory to be made. All these fine clothes that you wear are made there. You have done with the old home-spun gray that you used to wear that was spun at home, and the factory is doing it. Why? Because they can do it better, and do it cheaper, and you can be doing something else and the people in the house can be doing something else to more advantage, and therefore the factory was established. Now, as time runs along, other factories are established for making steel and iron. Many a time I have helped the men at the blacksmith's forge make horseshoes. They do not make them now; they are made somewhere else. All these evolutions have gone along until to-day you have got to a point where the small corporations are getting into larger ones, because they want a larger tool of commerce to do the work with, a handier tool.

What became of the old stage coach? The country fellow that had a tavern or a half-way house, and the old stage drivers are swearing at the railroads, some of them, to-day. But the railroad is there. It is carrying yourselves and your commodities all over the continent. What has become of all these different industries that you can remember? It is not necessary for me to enumerate them. They have all gone into larger and better concerns. The mode of travel has changed. Time is obliterated by electricity. To-day, you are living in a wonderful age—so wonderful that even the moneyed interests of the country are scared to death because of the consolidations that are now occurring in all kinds of capital. Why is this? Bright men have seen—for instance, in your industry—that if you get all the mills together, or nearly all of them—if you could get them where one paper mill could be put on one kind of goods and another paper mill on another kind of goods, that you could make them cheaper, that you could make paper cheaper than you ever made it before. You have seen it right here to-night. Not only is this magnificent dinner served in this hotel, but half a dozen more of them are being served in this same hotel. That is consolidation on a big scale, and it seems to me that everybody is pretty well served. Everybody is full enough. [Laughter.] What has been the result of these commercial enterprises, these great tools of commerce, these great trusts, as they used to call them?

The price of oil has gone from 60 cents to 6 cents a gallon. The price of sugar has gone from 12 cents to 5 cents a pound. The price of paper has gone from 21 cents to 2 cents a pound. The price of nails has gone from 12½ cents a pound to one cent a pound. A farmer used to take a pound of butter for a pound of nails. To-day he takes a pint of skimmed milk for a pound of nails. That is the difference. You go through the whole list—crockery is reduced 50 per cent., and so on through the whole line of industry. They have been reduced according to an unerring law of nature; that is, that the more you reduce the article the more consumption you get for it. Take any single industry that has been established and has been worked as it ought to be worked, has cheapened the article to the consumer, and every single industry of that kind has raised the price of labor to the laborer. [Applause.] Labor organizations have done much toward raising the price of labor, that these large commercial tools of commerce that have the capital at their command to do their business properly, where they turn out the article produced at the lowest possible cost of labor, enhance the price of labor by that amount. [Applause.]

I want to give you one illustration, which is convincing and which has not been touched by my friend, Warner Miller, or Brother Reid, or any of these men who believe in high protection, and that is the protection of boots and shoes in this country. To-day we are furnishing Paris and London with their fine gaiters, with their finest shoes and their finest boots made in this country. Why? Because by labor-saving machinery we have learned to make them, and we can produce them for the markets of the world because France and England put more labor into a given shoe or a given gaiter than we do. Now, the duty on boots and shoes has not been over 34 per cent., a revenue tariff, all the while; so that the tariff has not affected it; but the price of labor in the boot and shoe industry equals that of any other industry in this country, and, therefore, it proves the point, because there is one that could not be affected by the tariff. If you had a high tariff your laborer might get more, but he does not get more because he has less labor in a given number of boots and shoes. Now, therefore, labor should go hand in hand with capital, and should stay there with all these industries whenever they are consolidated or in whatever form, if the men at the head of them have brains enough to run them. Now, the danger to this republic and to this country in these large combinations I want to point out. In combinations of capital in this country, no matter how large, that attempt to raise the price of an article above the point of competition ought to be throttled by the legislatures or by the general government and be made to serve the wants of the people. When they get capital enough to run their organization let them run it in the interests of the people, but if they attempt to raise the price so that the price of their article is higher than others can make it for, they will get corpulent and generally burst themselves. Therefore, you should put your greatest skill into all these combinations, so that you can serve the public by making these articles cheaper than we get them now. In doing that you will raise the price of labor, as you ought to do, and no country is ever ruined by raising the price of labor. Again, there is another danger in the consolidation of these organizations, and they are moving with lightning pace toward concentration and consolidation in all organizations where they see a saving. Mark you, do not be greedy capitalists; do not be greedy manufacturers. In putting these things together do not put a valuation upon your plant, and then a valuation on what you earn and give it to them in common stock. [Laughter.] Do not be greedy, I say, because the whole financial fabric of the country will fail if you alter these things to what you think they are worth. Make that common stock one-quarter, or one-half, the price, whatever the amount you have you will issue, and then you stand an equal chance. Your very laborers that are thrown out of employment, some of them, if you can make their small earnings greater, they will get one share or two shares, or ten or twenty, for their families. Do not utter a stock that is watered. Do not utter a stock that is not worth the money.

When you get labor and capital harnessed, as they will be, and as they should be, by these organizations properly organized then you will solve the labor problem that is agitating the country more than anything else; and when you have done that, when you have made this investment sure for your laborers, when you have fixed it so that a man dare put his money in because it is honestly put up and you are yielding a good income, then you will never lack for capital and you will have an organization that will furnish the world, as it has been doing in the last year, with the products of this country faster than you know. It will furnish to China that which has hardly been opened to a door knob from this country yet; $200,000,000 of manufactures will go from this country there in the next twenty years if you will manufacture as you should and make your stock to suit the honest investigating demand of the country. Do this in your organization, and you will make this a republic as solid and secure as the rock on which this combination rests. [Applause.]

The President—Our next toast is "Journalism and the Public Welfare," and will be responded to by one who possesses that rare quality, so much desired, of being an able after-dinner speaker. I have the pleasure of introducing to you Major Z. K. Pangborn.

RESPONSE BY MAJOR Z. K. PANGBORN.

Mr. President. Ladies and Gentlemen—I assume that the compliment paid me is simply formal; it does not matter much about the ability of an after-dinner speaker; his best quality is to say what he has to say quickly and have done with it.

I presume I was called upon because I happened to be a Jerseyman. But for New Jersey, gentlemen, New York city would be a very small city. Without New Jersey she would have neither oysters nor clams or cranberries or mosquitoes [laughter] or many pretty girls, and no place to go to organize her trusts and corporations. [Laughter.]

I do not know how the title of your association was originally made, but I can see that it was made as it ought not to have been—like the Irishman's cart and horse with the positions reversed, the cart being in front and the horse behind. You call it the American Paper and Pulp Association. It should have been the American Pulp and Paper Association, because the pulp must precede the paper. A necessary preliminary and perquisite to all paper is pulp. I do not know how many of you are pulp men and how many are paper men; it does not matter; but it is clear enough to me that the seniority is not where it belongs, and the name of your firm ought to have been reversed. The paper men seem to have acted very much in making this title, as the young fellow did whose father, Mr. Simpson, had carried on business quite successfully, and had been, as they say in the country, quite forehanded, and he said to his son, John H. Simpson: "John, it is about time for me to let you into the firm; I think I shall admit you as a partner." "All right," said John, "I am glad to hear it." Then the father said: "What shall the title of the firm be?" "Well," said John, "I don't know, father, but I guess 'John H. Simpson, Jr. and father' will do very well." [Laughter.]

It seems to me that is where the paper men have got the best of the pulp men. But it is very certain that pulp and paper are the necessary preliminaries and perquisites to anything like public journalism, for public journals, first and foremost, is largely a matter of paper. Without paper there would not be any newspapers to lie in or to quarrel about or to criticise. I think you gentlemen of this association appreciate how important a factor paper is in the structure and life and business of modern civilization. The ancient geographers who did not know anything about the form of this earth came as near to it as they could when they described the world, which they supposed to be flat, as resting on four pillars. The four corners of the earth are spoken of in Assyrian and Chaldean and Egyptian chronicles and alluded to in the Scriptures. What the four pillars rested on they did not trouble to inquire. Now, there are four material pillars upon which commerce and business and social life and the interests of modern civilization largely depend and rest. If I were called upon to name those four material pillars on which all this structure is built I should name them as these: First comes, of course, the fruits of mother earth; the grain, the grass, the fruit. The next in importance I should name would be iron. Iron is an absolutely essential support of all the business in modern times. Without it none of you would have been here to-night. Without iron and its eldest daughter, the brilliant steel, you would have no transportation such as you have now across your continent and across the sea. You would have no railroad lines, no telegraphs, no telephone wires. You would be remanded back to the conditions of a thousand or two thousand years ago. I should name as the third pillar upon which you rest, gold. Gold, the absolutely essential basis of commercial and financial business. Without that you could not carry on the great commercial and financial operations of the world to-day, for I do not believe there is a man within the sound of my voice who entertains any longer, if he ever did entertain it, the absurd idea that there can be such a thing as a bi-metallic measure of values of commerce and business. [Applause.] There can never be, any more than you can measure a yard of cloth by two yardsticks, one 36 inches and the other 18 inches long. Gold is the standard and shall be the standard from this time onward in the commercial world, and all your banking, all your commercial transactions can be done safely and securely. And the fourth pillar, gentlemen, is paper. Suppose you eliminated paper from the civilization of to-day, you might as well all be dead and have Dr. MacArthur pronounce your funeral oration. Is there anything you can do without it. The paper produced out of the pulp by your manipulation serves every possible and conceivable purpose in domestic, commercial and social life. Where would the business of your Clearing House be without the little slips of paper on which the transaction are noted? Where would you be when you wanted to get payments from your debtor and he could not find a scrap of paper to write a promissory note on? Where would the lover be if he could not find anything on which to pen his effusions to his lady-love?

Where would your book publishing houses be if there were no manuscripts, and where would your manuscripts be if you had no paper to make them on? Paper lies in and around and beneath and over everything. You can no more do without it to-day than you can do without the breath of heaven and the sunlight that makes you warm. It is wonderful the number of uses to which paper is put. You know it all as well as I do. The more you think about it the more you will see how largely and how minutely the simple thing that is turned out of your paper mills enters into all your business and ours. Hence I say, that upon these four pillars rests the whole structure of our modern life and business, and you do well to associate yourselves together not only to make paper, but to sell it.

The text is public journalism and public welfare. Dr. MacArthur will tell you that in the pulpit they do not pay much attention to the text. Public journalism was not developed originally perhaps out of paper. Public journalism grew as the needs of society grew, as the demands of civilization and politics grew. Brains are necessary, thinking is necessary to public journalism, and the grand invention of printing was necessary and all the improvements that have come with such great rapidity have shown you what an enormous engineer public journalism has become. What is the relation of public journalism to public welfare? In the first place, public journalism is an educator. In that respect public journalism has an unmistakably correct function, and to-day with all its faults, with all its deficiencies, with all its erratic manœuvres, and perhaps with all its mistakes in departing from the truth now and then, public journalism is nevertheless to-day the great educator of the American people. [Applause.]

We are justly proud of our system of free public schools. We have set an example to all the world of our faith in the general intelligence of the thinking part of the community, of the men and women and of the boys and girls who represent the men and women, by giving them all a chance at our free public schools, and over and above that the journals of the United States of America, the newspapers, the magazines, the periodicals, penetrate every home, go everywhere, and there is more study, more thought and more learning and real instruction in the journals of to-day than in any other single influence anywhere. [Applause.] The journals are cheaper in this country than they are anywhere else. I think Mr. Reid spoke of paper being cheap. In my judgment paper is too cheap. [Applause.] I speak as the oldest editor in this room. It is exactly fifty years since I began newspaper work, and I claim to know something about it. He talked of paying a high price for paper. I paid as high as 37 cents a pound for paper, and I say that paper to-day is too cheap and newspapers are too cheap.

There is nothing sold to-day in the city of New York so cheaply as the daily newspapers of the city. There is no commodity which you consume every day from which you get so much value and for which you pay so little as the daily papers. Contrast our situation with that of other countries. Look at Austria to-day. On every newspaper printed in that empire there is a tax of one farthing before the citizen can get his paper, and there is a tax of a half penny on foreign pennies. In Russia and Austria and Turkey the Government has the power to prohibit the introduction of foreign journals. Vienna with a population of a million of people has 600 issues of her daily papers in a day, and the people do not buy them or read them; those who do read them get them in the cafés, while here in America there is no citizen unless he is absolutely destitute, so poor that he cannot afford to buy just as many daily papers as he wants and gets all the information about everything happening all over this globe of ours as cheaply as the millionaire can get it. [Applause.] And the pulp grinders and paper makers are doing their share along with the publishers and editors in educating the American people in that way.

I can show you the difference between the journalism of to-day and a few years ago, but I do not want to criticise the public journalism of to-day. It has wholly changed in its character in a great many respects. Not only have the appliances for printing changed enormously, and always for the better, but the method of conducting journals is entirely different from what it was half a century ago. Thirty or forty years ago the editor of a daily paper was, in fact, the editor, and no man put a shackle on his wrist. In the city of New York there were men at the head of public journals whose word meant something, and when they spoke they were listened to, and there was power in those journals, because the editor was absolutely independent.

I regret to say that during the last quarter of a century there has been a gradual trenching of the counting room on the editorial office, and shackles are on the wrist of many men who would speak freely if they were not held back by commercial reasons. I shall welcome the day when editorial liberty returns, and when the press of the country expresses the thought of its brainiest and largest men without any restriction. But with all that, public journalism on the whole has done its duty fairly well. Of course, there are gradations—one newspaper is better, and another is worse, but on the whole the general tone of the public journals of this country can be depended on to be about right. There is no journal, no editor, no publisher, who is unwise enough to run against what he believes to be the general trend of popular sentiment and public opinion. The intelligence, educated sentiment, of the American people is generally on the right side. It goes wrong sometimes, but it comes around right at last, and the public journals of this country have done their duty in all the important occasions and crises that have arisen.

When the civil war came there was no more powerful influence in this loyal North that sustained the hand of Abraham Lincoln than the influence of the loyal, united union press, of the United States. [Applause.] It did its work thoroughly and well, as well as the clergy and as well as the soldier. It was the same when this recent struggle came upon us, so suddenly and unexpectedly.

Nobody a year ago dreamed of what has happened within the year, nobody could have imagined it, and the nation and the world was astonished on that morning in last May that saw the first development of the policy of the government in that respect; on that day when the order had flashed under the sea to the Vermont boy of whom I am so proud, because I was his teacher [Applause], and he got his message to capture or destroy the Spanish fleet, and straight as an arrow shot from a tried and trusty bowstring, Dewey swept down upon the Spanish fleet and in one single, short,

(Continued on page 151)

IMPORTS OF PAPER STOCK AT NEW YORK.

FROM JANUARY 29 TO FEBRUARY 5, 1899.

Whence Imported	Rags.	Old Papers.	Chemical Fibre.	Manilla Stock.	
	Bs.	Bs.	Tons.	Bs.	Coils
Antwerp	2,463	....	....	2,411	....
Bordeaux	69	....	....	....	....
Bremen	133	....	....	361	....
Bristol	....	....	....	....	132
Buenos Ayres	95	....	....	....	....
Copenhagen	91	....	208	680	145
Dundee	....	....	....	1,315	....
Dunkirk	239	....	....	207	131
Glasgow	..	164	....	....	....
Hamburg	1,327	9	....	506	66
Hull	354	....	50	819	730
Leghorn	893	....	....	....	....
Liverpool	89	....	....	31	592
London	367	91	....	90	457
Marseilles	....	....	....	340	83
Newcastle	87	5	....	82	662
Rotterdam	128	....	50	93	....

Paper.

John Hunter, Ohio, Hull, 5 cs.
G. W. Sheldon & Co., Alesia, Marseilles, 50 cs.
W. H. Aldrich & Co., Germanic, Liverpool, 2 cs. hanging.
W. H. S. Lloyd, by same, 10 cs. hanging.
Kupfer Brothers, by same, 9 cs.
E. & H. T. Anthony, by same, 1 cs.
E. Morgan's Sons & Co., by same, 11 cs.
Schulze, Brooke & Darling, by same, 5 cs.
L. C. Wagner & Co., Kensington, Antwerp, 3 cs.
Dingelstedt & Co., by same, 20 cs.
Eastman Kodak Company, by same, 89 cs.
G. W. Sheldon & Co., by same, 2 cs.
S. Barling, Anchoria, Glasgow, 8 cs.
A. Sartorius, Etruria, Liverpool, 5 cs.
Henry Bainbridge & Co., Paris, London, 2 cs.

NEW YORK IMPORTS.

FROM FEBRUARY 8 TO FEBRUARY 15, 1899.

Paper Stock.

A. Katzenstein, Kensington, Antwerp, 129 bs. rags.
Train, Smith Company, Panama, Bordeaux, 69 bs. rags.
Frederick Bertuch & Co., Ohio, Hull, 10 cs. chemical fibre.
Train, Smith Company, Buffalo, Hull, 131 bs. manillas.
Train, Smith Company, Cevic, Liverpool, 40 coils rope.
J. W. Mason & Co., Georgic, Liverpool, 55 coils rope.
Devoy Brothers, America, London, 68 bs. rags.
J. Libmann & Co., Manitou, London, 22 bs. rags.
Train, Smith Company, Crona, Newcastle, 82 bs. rope, 5 bs. old papers.

Bleaching Powder.

A. Klipstein & Co., Cuthbert, Antwerp, 38 cks.
Fuerst Bros. & Co., Westernland, Antwerp, 50 cks.
F. A. Reichard, by same, 63 cks.
Roessler & Hasslacher Chemical Company, Norge, Hamburg, 300 cks.
J. L. & D. S. Riker, Cevic, Liverpool, 280 cks.
Read, Halliday & Sons, by same, 82 cks.

Soda Ash.

Wing & Evans, Georgic, Liverpool, 320 bgs, 140 cks.

BOSTON IMPORTS.

FROM FEBRUARY 8 TO FEBRUARY 15, 1899, INCLUSIVE.

Paper, Etc.

The B. F. Wood Music Company, Carinthia, Liverpool, 8 cs. printed music.
Oliver Ditson Company, by same, 4 cs. printed music.
Dennison Manufacturing Company, by same, 10 bs. paper.
J. Lane, by same, 11 cs. printed matter.
A. H. Davenport, by same, 1 cs. hangings.
J. W. Gerry, by same, 1 cs. hangings.
American Express Company, Baltimore, London, 100 cs. paper.
Forbes Company, Canada, Liverpool, 1 cs. printed matter.

Paper Stock.

E. Butterworth & Co., Canada, Liverpool, 123 bs. rags, 82 bs. manillas.
Horace Dutton & Co., Sachem, Liverpool, 155 coils manillas.
Castle & Gotthiel, Baltimore, London, 89 bs. rags.

Sizing.

Thomas Groom & Co., Carinthia, Liverpool, 80 bgs.
Holyoke Paper Mills, by same, 105 bgs.
Baeder, Adamson & Co., Sachem, Liverpool, 282 bgs.

Bleaching Powder.

J. L. & D. S. Riker, Canada, Liverpool, 88 cks.
J. L. & D. S. Riker, Sachem, Liverpool, 436 cks.

Soda Ash.

Warren & Co., Canada, Liverpool, 200 bgs.
Warren & Co., Sachem, Liverpool, 109 cks.

Soda Crystals.

Warren & Co., Sachem, Liverpool, 280 bbls.

EXPORTS FROM NEW YORK.

FROM FEBRUARY 7 TO FEBRUARY 14, 1899.

BOOKS, to Antwerp, 3 cs.; British West Indies, 3 cs.; Bremen, 3 cs.; Cuba, 7 cs.; Central America, 10 cs.; Dutch West Indies, 1 cs.; Havre, 13 cs.; Hamburg, 8 cs.; Hong Kong, 1 cs.; Liverpool, 6 cs.; London, 6 cs.; Lyons, 1 cs.; New Zealand, 19 pkgs.; Porto Rico, 6 cs.; Rotterdam, 1 cs.; United States of Colombia, 6 pkgs.; Venezuela, 1 cs. Totals—25 pkgs., $301; 70 cs., $5,113.

CARDS, to British Africa, 6 cs.; British West Indies, 3 pkgs.; Australasia, 2 cs.; Dutch West Indies, 1 cs.; New Zealand, 7 cs. Totals—16 cs.; $790; 3 pkgs., $67.

LABELS, cases, to Hamburg, 2; London, 1; Porto Rico, 7. Totals—10 cs., $712.

PAPER, to Antwerp, 120 cs.; Australasia, 22 bdls., 7 cs.; British West Indies, 481 pkgs.; Brazil, 142 pkgs.; British Honduras, 25 pkgs.; Bolton, 50 cs.; Bremerhaven, 26 cs.; Cuba, 1,421 pkgs.; Central America, 14 pkgs.; Chili, 2 pkgs.; Canada, 36 cs.; Dutch West Indies, 10 pkgs.; Glasgow, 3 cs.; Hamburg, 1 pkg., 6 cs.; Liverpool, 66 cs.; London, 1,792 pkgs.; Manchester, 1 pkg.; Mexico, 4 pkgs.; New Zealand, 406 pkgs., 4 cs.; Porto Rico, 2,002 pkgs.; Peru, 5 pkgs.; United States of Colombia, 17 pkgs.; Uruguay, 2 pkgs.; Venezuela, 13 pkgs. Totals—327 cs., $4,612; 6,338 pkgs., $22,049; 22 bdls., $333.

PAPER BAGS, to Australasia, 70 bdls.; British West Indies, 4 bs.; Brazil, 142 pkgs.; Cuba, 13 bdls.; Central America, 1 bl.; New Zealand, 97 bs.; Peru, 11 bs.; United States of Colombia, 1 bl. Totals—142 pkgs., $900; 83 bdls., $323; 114 bs., $532.

PAPER BOXES, to Argentine Republic, 2 cs.; British West Indies, 1 bx.; Central America, 2 bxs.; Japan, 97 cs. Totals—99 cs., $2,525; 3 bxs., $102.

PERIODICALS, cases, to Leipsig, 2, $140.

PICTURES, cases, to Australasia, 2; Berlin, 2; Bremen, 2; Havre, 26; Hamburg, 3; Liverpool, 4; London, 13; New Zealand, 5; Porto Rico, 5. Totals—62 cs., $2,514.

PLAYING CARDS, cases, to Argentine Republic, 3; London, 4. Totals—7 cs., $1,045.

PRINTED MATTER, to Antwerp, 2 cs.; Australasia, 4 pkgs.; British West Indies, 1 cs.; Bremen, 5 cs.; Bremerhaven, 3 cs.; Brazil, 4 pkgs.; Cuba, 1 pkg.; Havre, 6 cs.; Hamburg, 9 pkgs.; Liverpool, 44 cs.; London, 39 pkgs.; New Zealand, 9 cs.; Philippines, 1 cs.; Rotterdam, 1 cs.; United States of Colombia, 6 cs.; Uruguay, 1 cs.; Venezuela, 1 pkg. Totals—58 pkgs., $2,843; 79 cs., $9,620.

STATIONERY, to British Guiana, 2 cs.; British West Indies, 6 cs.; Australasia, 9 cs.; Bremen, 2 cs.; Brazil, 1 cs.; British Honduras, 1 pkg.; Cuba, 24 cs.; Central America, 17 pkgs.; Chili, 2 pkgs.; Glasgow, 5 cs.; Hamburg, 2 pkgs.; Hong Kong, 1 cs.; Liverpool, 6 cs.; London, 63 cs.; Mexico, 4 pkgs.; New Zealand, 30 cs.; Porto Rico, 4 pkgs.; Peru, 5 pkgs.; United States of Colombia, 14 pkgs.; Uruguay, 2 cs.; Venezuela, 6 pkgs. Totals—65 pkgs., $1,582; 160 cs., $9,408.

TAGS, case, to Hamburg, 1, $14.

TWINE, bales, to British Honduras, 2; Cuba, 1; Central America, 5; Chili, 2; Ecuador, 9; New Zealand, 1; Peru, 1; Tasmania, 1; United States of Colombia, 5; Venezuela, 24. Totals—51 bs., $917.

WALL PAPER, cases, to British West Indies, 1; Canada, 2; Ecuador, 2; Havre, 8; London, 3; Marseilles, 8. Totals—24 cs., $560.

ANILINE COLORS, casks, to Canada, 7, $1,050.

BURLAPS, bales, to Uruguay, 25, $1,255.

CAUSTIC SODA, to Cuba, 15 drms.; Venezuela, 23 bbls. Totals—15 drms., $244; 23 bbls., $377.

COTTON WASTE, bales, to Cuba, 30; Central America, 4; Hanover, 70; Hamburg, 734; Stuttgart, 94; Venezuela, 1. Totals—942, $15,578.

PAPER FINISH, casks, to Liverpool, 10, $55.

PAPER MAKING MACHINERY, case, to Manchester, 1, $100.

RAGS, bales, to Antwerp, 30, $700.

ROSIN, barrels, to Australasia, 200; Brazil, 710, Cuba, 25; Chili, 400; Glasgow, 100; Mexico, 3; New Zealand, 10; Peru, 170; United States of Colombia, 62; Venezuela, 62. Totals—1,742 bbls., $4,989.

SAND PAPER, to Antwerp, 36 bdls.; Bremen, 1 cs.; Cuba, 14 pkgs.; Chili, 11 bdls.; Christiania, 1 pkg.; Glasgow, 3 bdls.; Havre, 2 cs.; London, 55 pkgs.; New Zealand, 2 cs.; Peru, 6 bs.; United States of Colombia, 2 pkgs. Totals—5 cs., $93; 56 bdls., $766; 72 pkgs., $634.

SODA ASH, barrels, to New Zealand, 15, $70.

WOOD PULP, to Antwerp, 2,479 rls.; Havre, 539 rls.; Hamburg, 264 rls.; Hamburg, 483 bs. Totals—3,282 rls., $7,820; 483 bs., $3,364.

Total exports for the week, $7,618,664.

Mortgages, Etc.

[In the appended list R. signifies a renewal of a pre-existing mortgage; B. S., bill of sale; T. Dr. trust deed; T., trust mortgage; F., foreclosure; Real, a mortgage on real estate; C., conveyance, realty; Pr., printer; P., publisher; W. P., wall paper; B. and S., bookseller and stationer; S., stationer; M., news; D. S., department store; No., notions; Bi., bicycles; M., music; Pic. M. & S. C., picture mats and showcards.]

EASTERN STATES.

Mortgagor.	Amount.
L. J. D. Perkins (N.), Portland, Me.	$700
W. E. Londorgan (W. P.), Springfield, Mass	1,000

WESTERN STATES.

Boulder Publishing Co., Boulder, Col.	1,000
Hugh Leonard et al. (Pr.), Denver, Col.	400
H. G. Buss (S.), Pekin, Ill.	2,300
Tracy A. Smith (S.), Pekin, Ill. (B. S.)	8,558
A. V. Whitney (B. & S.), Peoria, Ill.	175
Jas. O. Addison (D. S.), Knightstown, Ind.	3,000
M. L. Emyart (P.), Macy, Ind (Real)	150
John P. Young (P.), Cedar Rapids, Ia.	350
Wm. E. Blackburn (P.), Anthony, Kan. (Real)	300
Henry Hooper (No.), Owosso, Mich.	216
Frederick A. Payne (Pr.), St. Paul, Minn. (B. S.)	750
Francis L. Flanders (Bi.), Kansas City, Mo. (Real)	5,000
The Maumee Cycle Co., Toledo, Ohio (F.)	6,266
Allen & Rush (P.), Colville, Wash. (Real), W. D. Allen	175
Donald Ross (S.), Pullman, Wash.	275

CANADA.

North Sydney Book & Variety Co., North Sydney, N. S. (B. S.)	1

LIENS DISCHARGED.

C. B. Sherlock (et al., M.), Salina, Kan.	200
Henry Pronnett (W. P.), Adrian, Mich.	1,000

JUDGMENTS.

Daniel Crilley (T.), New York, N. Y.	169
Richard Gledhill (W. P.), New York, N. Y.	1,467
Geo. B. Von Essen (P. M. & S. C.), New York, N. Y.	86
Geo. W. Shancor & Son (W. P.), Harrisburg, Pa.	1,600

Changes, Removals and New Firms.

Wetherell & Carpenter, manufacturers of paper at Newington, Conn., have been succeeded by Frank Carpenter.

Messrs. R. G. Reid & Sons, Montreal, P. Q., have formed a large company under the name of the Newfoundland Bleached Pulp Company, with a capital of $2,000,000. The scheme also includes the formation of the Newfoundland Pyrites Company, with a capital of $1,500,000.

John Campbell & Co., 118 Warren street, New York, have removed their business to 75 Hudson street.

New Mills for Newfoundland.

Large wood pulp mills will be built in Newfoundland within two years. Our English contemporary, Paper and Pulp, states that R. G. Reid and his sons have a contract with the Government of Newfoundland which practically gives them the whole island to exploit, and have given notice that at the next session of the Newfoundland Legislature they will make application to be incorporated as the Newfoundland Bleaching Pulp Company, with a capital of $2,000,000, and also as the Newfoundland Pyrites Company, with a capital of $1,500,000.

The site of the companies' operations is said to be most favorable, and preparations for commencing the work are in an advanced stage, all plans having been perfected and machinery ordered. They control an immense area densely covered with wood of the first quality on the shores of Grand Lake, not far from the railway, and close to it are the coal mines which the Reids are exploiting.

Water power is also available. The marble beds of the Humber, at a short distance, supply any desired quantities of lime, and near by, at Bay of Islands, are deposits of iron pyrites containing 50 per cent. of sulphur, from which sulphuric acid can be made. Some 20,000 tons of pyrites will be required annually for the pulp mills.

A company will be formed for mining and exporting these pyrites, as the deposits are said to be inexhaustible, and there is an increasing demand for it to be used in the manufacture of sulphuric acid, the residuum being used in making steel. The output of the pulp mills will be about 90 tons per day.

To Be Governor.

"There is absolutely no doubt," says the Boston Globe, "that Mr. Crane, the present lieutenant governor, will be the party candidate to succeed Governor Wolcott. That much has been decided on beyond the possibility of any mistake. All the leaders of the party have declared in favor of Mr. Crane, and he will be given a unanimous nomination.

"The strange part of Mr. Crane's candidacy is that he has not done the first thing to secure the nomination. Those who are 'on the inside' of Republican politics have known for a long time that some months ago Mr. Crane came to Boston and declined to be a candidate for lieutenant governor for the present year. This decision meant also that he would not accept the nomination for governor next fall.

"As soon as the news of Mr. Crane's intention was whispered to the party leaders there was a great scurrying to the Touraine, where the Dalton man was. They pleaded with him, they besought him, they brought all kinds of arguments to bear on him, and finally Mr. Crane consented to have his name go on the ballot once more. It was then and there resolved and settled that W. Murray Crane was to be the next Republican candidate for governor. It was easier to change the laws of the Medes and Persians than it will be to alter what was fixed there."

A Large Lot of New Filters.

The New York Filter Manufacturing Company reports that it has recently put in or has in course of construction filters for the following concerns:

Alpena Sulphite Fibre Company, Alpena, Mich.; Parsons Paper Company, Holyoke, Mass.; Riordon Paper Mills Company, Hawkesbury, Ont.; Duncan Company, Mechanicsville, N. Y.; Joseph Bancroft & Sons Company, Wilmington, Del.; George Wheelwright Paper Company, North Leominster, Mass., and the Parkhill Manufacturing Company, Fitchburg, Mass.

This is in addition to the present list of more than 130 different manufacturers who are using in all of their mills the various types of filtering apparatus built by this company.

General Notes.

The Chicago Chronicle is our authority for the statement that the great bulk of the underwriting of the $27,000,000 Union Bag and Paper Company, which will control over 90 per cent. of the output of paper bags in the country, has been taken by New York capitalists. Chicago gets a very small proportion of the stock, all that was available for that city having been given to a select few of the business friends of W. H. and J. H. Moore, who are promoting the big project. St. Louis will also be given a little of the underwriting.

The Frank Gilbert Paper Company, of Waterford, N. Y., has filed a certificate of the payment in full of its capital stock of $100,000.

TRAIN SMITH COMPANY,
IMPORTERS OF AND DEALERS IN ALL DESCRIPTIONS OF Paper Makers' Supplies.
24 FEDERAL ST., BOSTON,
BRANCH OFFICES: 140 Nassau St., NEW YORK. 14, 16, 18 & 20 St. Mary Axe, E. C., LONDON. 21 Irwell Chambers, Fazakerley Street, LIVERPOOL.

F. BREDT & CO.,
No. 194 Fulton Street, SOLE AGENTS FOR New York City, U. S. A.
JOSEPH PORRITT & SONS'
TRADE MARK. ENGLISH FELTINGS.
ALSO IMPORTERS AND DEALERS IN
MARINE BLUE (Aniline) for News Paper Mills,
Jacketing, Roll Cloth, Double Extra Canvas, Ultramarine Blue.

WATERPROOF LINING PAPER.
Unsurpassed for lining cases or wrapping goods for export where shipments are subject to moisture in transit.
HOLTEN & COLLINS,
509 Minor Street, - - - - - - - Philadelphia, Pa.

A. D. LITTLE, GRIFFIN & LITTLE, PAPER MILL CHEMIST,
7 Exchange Place, Boston. Long Distance Telephone 2312 Boston.
EXPERT IN THE SULPHITE PROCESS AND ALL CHEMICAL MATTERS PERTAINING TO THE MANUFACTURE OF PULP AND PAPER.

COCHRANE CHEMICAL CO.,
55 Kilby Street,
BOSTON, MASS. Manufacturers of Alum.
Highest tests, free from iron, and all other grades used by paper makers.
Also manufacturers of ACETIC ACID, SULPHURIC ACID and other chemicals.

SALOMON BROS. & CO.,
FORMERLY
FELIX SALOMON & CO.,
Importers of all Grades of Rags and Paper Stock,
99 NASSAU STREET, NEW YORK.
Representing
GEBR. SALOMON, Harburg/Hamburg, Germany
GEBR. SALOMON, Hanover, Germany.

Frederic C. Butler,
WHOLESALE PAPER AND TWINE WAREHOUSE,
13 S. 4th Street, PHILADELPHIA.
Philadelphia Agent, W. H. PARSONS & CO., New York, News.
Correspondence solicited with mills making..... SPECIALTIES.

A. WERTHEIM & CO., HAMBURG, GERMANY.
Exporters of All Grades of Sulphite and Soda Pulps.
SIGMUND GOLDMAN, Agent for the United States and Canada,
BENNETT BUILDING, 99 NASSAU STREET, NEW YORK

Our Fibre is made especially for
... BOOK PAPER MANUFACTURERS.
For a good, clean and strong
UNBLEACHED SULPHITE FIBRE
Write for prices and samples to the
MICHIGAN SULPHITE FIBRE CO.,
Factory Port Huron, Mich. 1416-18 Majestic Building, DETROIT, MICH
... SOLE AGENTS, ...
FREDERICK BERTUCH & CO. and H. O. BATEMAN,
Rooms 308 to 311 Temple Court Building, New York.

CASTLE & COTTHEIL,
TIMES BUILDING, 41 PARK ROW, NEW YORK.
IMPORTERS OF AND DEALERS IN
Old Linen and Cotton Rags, New Cuttings,
Jute Stock, Sizing, etc.
SULPHITE AND SODA PULPS.

Market Review.

OFFICE OF THE PAPER TRADE JOURNAL, FRIDAY, February 17, 1899.

THE MONEY MARKET.—Government bonds remained firm. Call loans brought from 2¼@3 per cent. Time money rates were quoted at 3½ per cent. for sixty and ninety days; 3½ per cent. for four, five and six months, and 3 per cent. on first-class securities. Commercial paper was quoted at 2¾@3¼ per cent. for bills receivable; acceptances and prime single names, 3@3½; other names, 4@4½ per cent.

THE PAPER TRADE.—The market has been rather dull, owing to prevailing storms, which have blocked trade in all directions. The special feature to be noted is the incorporation, since our last report, of a company with a large capital, to manufacture news in competition with the news combination.

JUTE BUTTS.—The market remains unchanged. Stock is short and prices remain firm. We quote: Jute Butts, paper quality, 1c.

WOOD FIBRE. There is no change in prices. We quote: Foreign Sulphite, bleached, No. 1, 3.15@3.50c.; Bleached Soda and Soda Sulphite Fibres, 2.70@3c., according to grade; unbleached, 1.90@2.15c.; Domestic Sulphite, unbleached, regular grades, is quoted at 1.60@1.85c.; Selected Quality, 2@2.35c.; Domestic Soda, bleached, 1.70@1.90c., delivered There were 10 tons of Chemical Fibre imported from Hull this week.

WOOD PULP.—We have no changes to note in the market. The price hovers around $12 f. o. b. at the mill.

FOREIGN RAGS AND PAPER STOCK.—The market has been quiet. Prices have not changed from those which we gave last week. We quote: German Blue Cottons, 1.20c.; Dutch Blues, 1.22½c.; Light Prints, 1@1⅛c.; New Cuttings, 2⅜@2½c. The total imports were 506 bs. and 95 coils, being 288 bs. rags, 5 bs. old papers, 213 bs. and 95 coils manillas. The quantities of shipment and the names of the ports whence shipped are as follows: Antwerp, 129 bs. rags; Bordeaux, 69 bs. rags.; Hull, 131 bs. manillas; Liverpool, 95 coils manillas; London, 90 bs. rags, and Newcastle, 5 bs. old papers and 82 bs. manillas.

DOMESTIC RAGS.—The market in Domestic Rags continues in about the same condition, and prices are practically the same as those reported last week. We quote: Rag Muss, .25c.; Satinettes, .40@.55c.; Common Dark Seconds, .50@.55c.; Mixed Cottons, .70@.80c.; Thirds and Blues, 1⅛@1¾c.; Thirds and Blues (street), ⅞@1c.; House Soiled Whites, 1.75c.; Street Soiled Whites, 1⅛@1¼c.; No. 1 Whites, 2⅜@2¾c.; New Black Cottons, .60@.75c.; New Common Dark Seconds, .60@.70c.; New Dark Cottons, 1@1¼c.; New Blue Cottons, 2@2½c.; New Light Seconds, 2½@3¼c.; New White Shirt Cuttings, No. 2, 3@3½c.; New White Shirt Cuttings, No. 1, 4½@5c.

BAGGING.—The Gunny market has not changed either in prices or demand. We quote: Manilla Rope, 1.90@1.95c.; Mixed Bagging, .55c.; Wool Tares, .90@.95c. Burlaps are quoted as selling at 82½@85c. The manilla stock imports at this port this week amounted to 365 bales and 265 coils. The ports of shipment and quantities are as follows: Hull, 131 bs.; Liverpool, 95 coils, and Liverpool, 82 bs.

OLD PAPER.—The market is rather sluggish. We quote: No. 1, Hard White Shavings, 1⅞@2¼c.; No. 1, Soft White do., strictly free from wood, 1.60@1.70c.; Soft White do., ordinary, 1.50c.; Ledgers, 1¼@1⅜c.; Ledgers and Writings, 1.10@1.20c.; Solid Printed Books, 90c.@$1; Mixed Shavings, No. 1, 75c.@$1; No. 2, .60@.65c.; Extra No. 1, Manillas, 1@1⅛c.; No. 1, Manillas, ordinary, .70@.80c.; No. 2, Manillas, .55@.60c.; Folded News, .40c.; Folded News (over issues), .45@.50c.; Crumpled News, .30@.35c.; Mixed Papers, .30@.35c.; Commons, .20@.25c.; Straw Clippings, .35c.; Binders, do., .40@.45c.

STRAW.—The market is quiet. We quote: Long Rye, .30@.45c.

ROSIN.—Trading is quiet and values are low, while stocks are ample only for present demands. Prices are unchanged. We quote: Common, Strained, $1.40; Good, Strained, $1.40; E, $1.45; F, $1.50@1.55; G, $1.60; H, $1.65; I, $1.75; K, $1.85; M, $1.95@2; N, $2.15; W G, $2.60; W W, $3.

CHEMICALS.—The most notable feature in this market was the consummation during the week of an important organization among chemical manufacturers for the purpose of regulating prices. The trade has shown improvement in all lines. Both Alkali and Caustic Soda are in good demand, while Bleaching Powder is scarce, with a tendency in prices to go higher. We quote: English Bleach, $1.60@1.62½; German Bleach, $1.60@1.75; Continental, $1.50@1.65; Alkali, 75@80c.; Caustic Soda, $1.45@1.75; Soda Ash, 65@75c.

CHINA CLAY.—The prices of China Clay remain unchanged and are firm at the following quotations: Foreign, $10@16; Domestic, $8@10.

BRIMSTONE.—There is little stock in the market for prompt delivery. Shipments are firm at $22.

TWINES.—There is no change in prices to report in the twine market essentially different from what were quoted last week. We quote: Sisal Hay, 7¼c.; Sisal Lath Yarn, 9⅜c.; Jute Rope, 3½@4½c.; Twines, Jute, 18, 10½c.; 24, 10½c.; 36, 10c.; Jute and Hemp, 18, 13@14c.; 24, 12½@13½c.; 36, 12@13c.; Hemp, 18, 16c.; 24, 5½c.; 36, 15c.; Marlines, Jute, 4½@7c.; 8, 7c.; 7, 6½c.; Jute and Hemp, 6, 9@11c.; 8, 8@10c.; American Hemp, 4¼, 11c.; 6, 11c.; 8, 10c.

COAL.—The supply of anthracite is rather limited, and the demand continues good. The price has been advanced 25c. by the combination.

Manufacturing News.

MIDDLE STATES.

James Leffel & Co., Springfield, Ohio, will build a new foundry, which will nearly double their capacity for castings.

That portion of the "old pulp mill," or Mill No. 6, of Crocker, Burbank & Co.'s plant, West Fitchburg, Mass., that was burned January 2, is to be rebuilt at once. Bids have been asked for, and as soon as the contract is let work will be begun. The machine room, where the principal damage was done, is to be built somewhat larger than heretofore and to be raised one story, so that it will be when completed on a level with the engine room. The new machine room will be 132x38 feet, while the old room was about 90 feet in length and not so wide. A new paper machine will be placed in the room.

D. L. Taylor, of Kensington, was in Thompsonville, Conn., looking for a suitable location in which to engage in the manufacture of paper bags. A brick building owned by the Hartford Carpet Company, and known as the "Old Wash House," may be secured.

The Schroon River Pulp Company, Warrensburg, N. Y., contemplate building a large paper mill next spring, to be operated in connection with its pulp mill.

The Marshall mill, Turner's Falls, Mass., has started up to run out a few orders that were pressing.

Advices from Livermore Falls, Me., state that work is progressing favorably on the foundation of J. F. Henry's pulp mill at that place.

Owing to the very rapid increase in the price of raw materials, the Cahill sales department of "Cahill" water tube boilers, Pittsburg, Pa., have increased the price of all boilers of their manufacture 20 per cent., to take effect on March 1.

It is reported that the Washington Pulp and Paper Company, now lessees of the paper mill formerly operated by the Ondawa Paper Company at Middle Falls. N. Y., are contemplating forming a corporation to buy the mill, and it is said the Elsas Paper Company, of New York, are to be interested.

WESTERN STATES.

It is stated that the Kimberly & Clark Company and other Oshkosh and Neenah parties are about to build a mill at White River Rapids, on the Menominee River, Marinette, Wis., to manufacture 60 tons of paper per day. The company, which is to organized immediately, will be capitalized at $400,000.

The new mill of the Fletcher Paper Company, successors to the Alpena (Mich.) Sulphite Fibre Company, started up February 1. It is equipped with one Rice, Barton & Fales 112-inch machine, and another will be put in at once. The capacity is 40 tons.

CANADA.

The St. John, N. B., Daily Press tells of the formation of another American syndicate to operate in New Brunswick and says that Mr. Evans, brother of General Manager Evans, of the Maine Central, has returned to Fort Fairfield from Boston and states that a syndicate of Boston capitalists has been incorporated under the mme of the New Brunswick and Victoria Pulp Company to operate at Andover and Perth, on the St. John River. The company has Mr. Mills, a civil engineer of Andover, at work making the surveys. They intend to build a dam at Indian Point, about 1 mile above Andover, at a cost of $10,000, and operate an electric light plant in Perth and Andover, after which a pulp mill is to be put up. The horse-power at Indian Point is estimated at 30,000. The Tobique Narrows is of itself almost a natural dam, for the ledge of solid rock on each side runs from 60 to 75 feet and leaves only a small opening or passage for the water to pass through, thereby forming almost a natural dam, which will save the company considerable expense.

Standard Size in Business Paper.

Standards of size and weight are like social customs in that they result from agreements taught by experience. Individuality in vital matters is always to be encouraged, but relative uniformity in things of common use is a convenience.

Every one has had trouble in the filing of letters, bills, receipts and other papers that are in daily service in the commercial world, because one man spreads a bill over a sheet of foolscap and another puts a more important accounting on a tiny scrap that is liable to loss, for the simple reason that it is hidden among the larger sheets.

The paper dealers and printers could remedy much of this inconvenience if they would agree on certain shapes and sizes, as they have agreed on the note size, the letter size and the legal and sermon and foolscap sheet.

Such an agreement would simplify and cheapen press work, since supplies could always be had on order, without the trouble of preliminary measurements and cutting, and it would be good for all who do business and who must handle and file thousands of such papers in the course of a year, some of them of value and importance.—Brooklyn Eagle.

[Another standard is greatly desired, and that is in the size of catalogues and circulars. It may not be generally known to paper manufacturers, but the American Society of Mechanical Engineers has adopted a standard of sizes for the above purpose, which is largely used by machinery manufacturers. The principal size is 6x9 inches. Other standard sizes are 9x12 and 4½x6 inches.—Ed. P. T. J.]

MATHIESON ALKALI WORKS

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THE BANQUET.

(*Continued from page 148.*)

sharp and brilliant engagement he buried the Spanish flag forever beneath the waters of the Philippines, and it will never again float there in sovereignty. [Applause.]

With scarcely an exception the public journals of this country rose equal to the situation at that time and stood shoulder to shoulder and hand to hand with true American spirit and said "Good" to whatever the American administration, the American Congress and the American army and navy had done. [Applause.] So I claim much credit for the press. I do not care if they now cavil and find fault somewhat. That is free to us all.

That is another good thing about our American life. There is perhaps a little too much license, but it is good for a healthful freedom. It takes the press some time to learn some things. Forty years ago this year I was the only editor in the city of Boston—I was then the editor-in-chief of the Boston Atlas—I was the only editor in the city of Boston who would give to the cause of woman's suffrage even a decent hearing. I stood alone among my editorial brethren in being in full sympathy with the women who said "Give us our rights under the Constitution and the laws of the United States." I said: "I will help you whenever you can help yourselves." At that time, as I tell you, I stood entirely alone.

To-day, how is it? Why, the newspapers of the country now vie with each other in paying court to the women. They almost tumble over each other in their haste to show their good will to the mothers and wives and sweethearts of America, and they would give them to-day everything they ask for. [Applause.] And why should they not? I notice you have no toast to the ladies. They do not need it. The customary sentiment is "God bless the ladies." I would ont say "God bless the ladies," for God always has done that. But I would say the ladies are God's blessing to mankind. That is what they are. Are they not? [Applause.] They are the supreme blessing. God has showered other blessings on the world, but woman—I like the name better than lady—it is strong and swet and tended—woman, is not she the blessing of God? Like God's genial sunshine that breaks over the clouds and mountain tops in the morning, or like the moonbeam that makes the night calm and holy, and like the stars that spangle the firmament above.

God made all these things, and when he had made the whole creation he pronounced it good, and then he set man over it. There was still a blessing that remained, and that man had not received and the world was without, and God found his great good work by making woman as the greatest blessing of mankind. [Applause.]

The President—Our next toast, "America and Spain; the Survival of the Fittest," will be responded to by one whose remarks I am sure you will listen to with great interest and pleasure, he being especially qualified by his training and profession to discuss the subject impartially. I have the honor and the pleasure of introducing to you the Rev. Dr. Robert S. MacArthur.

RESPONSE OF REV. DR. ROBERT S. M'ARTHUR.

Mr. President and Gentlemen of this Association and Ladies who honor us by their presence—I am accustomed to have silence when I speak, because I usually speak in churches. [Applause]. If I cannot command silence I will not blame you; I will blame myself. But I am not going to blame myself until we have decided the matter of whether we are to have silence. I want to say that I am talking to those out in the hall and I want them to listen or I shall not speak. Will those who are there tell them I am talking to them as well as to those that are here. [Applause]. Now we will have it quiet.

The year 1898 is the annus mirabilis in the history of the American republic. The explosion of the sunken dynamite that destroyed the Maine rang the death knell of Spanish dominion in American waters. [Applause]. The waves that float over the wrecked Maine buried forever the hope of Spanish control in the Western Hemisphere. We always are disposed to depreciate the present. We see the past bathed in the mists of memory. We see the future hallowed in the splendors of hope. But the present is cold, barren, threadbare, commonplace. Much as we honor Abraham Lincoln to-night, Lincoln whose name and fame lift themselves like a mighty dome over the American republic, a dome through which the sun shines by day and the moon and stars by night, leading this republic onward, upward, outward, until to-night she sits crowned as queen in the congress of nations; we shall honor Abraham Lincoln vastly more when 100 years have passed than we honor him to-night. To the man who lives fifty or a hundred years hence the war of the last ten months in its relation to the American Republic will make it the most wonderful ten months since the days of the declaration of American independence. We have lived more in those ten months than ordinarily we would have lived in 100 years. [Applause]. I stated in the presence of some of you at one of our clubs last Saturday night that we might discuss the question of expansion as an academic question, but the simple fact remains that we have expanded and we never can take that back. [Applause]. We have seen this country take her great place in the history of the nations of the world.

This is a war between widely differing civilizations. It is a war between ignorance, bigotry and superstition on the one side, and intelligence, liberty and religion on the other side. Out of Spain's population of nearly eighteen millions well-nigh twelve millions are illiterate. It is a war between Latinism and Anglo-Saxonism; it is a war between medievalism and modernism; it is a war between tyranny and liberty; it is a war between the most despicable civilization of modern times and the noblest civilization of all times; it is a war between the sixteenth and the twentieth centuries; it is a war betwen the Satanic Inquisition of Torquemada and the American Constitution.

This is war for the triumph of nations which have the right to survive. Our Lord formulated a universal and eternal principle when he said, "Unto every one that hath shall be given, and he shall have abundance; but from him that hath not shall be taken away even that which he hath." This statement is not true simply because our Lord made it; but he made it because it is eternally true. Whosoever rightly improves what he providentially possesses shall, in harmony with natural law, possess vastly more; but whosoever misimproves what is committed to him, shall lose all that he has. This law is universal and eternal. Spain proved herself unworthy of her great possessions alike in the New World and in the Old World. God has virtually placed the American people at the portal of the twentieth century, and has given them command not only to refuse admission to the civilization of the sixteenth century, but to drive it utterly from this Western Hemisphere. Scientific men have recognized this law and have described it as the "survival of the fittest." Darwin calls "natural selection," by which he means that process in nature according to which plants and animals which are best fitted to survive and propagate, the "survival of the fittest." A similar law is fully illustrated among the nations of the earth. Lord Salisbury has recently appropriately described certain peoples as "dying nations." Each nation has its subtonic, its diapason. So has each century. The eighteenth century went out in revolution and blood; but out of that revolution came the sovereignty of the people, which is the chief glory of the nineteenth century. The nineteenth century will go out with the spirit of humanity, with the note of brotherhood, with the duty of altruism as its diapason, as its inspiring slogan, as its divine bugle-call to the nations of the earth. In this spirit the fife sounds and the pibroch shakes the air as the nineteenth century closes and the twentieth century opens.

Spain has proved to be utterly unworthy of the great opportunity which divine Providence placed before her. She must see all her colonial possessions taken from her cruel grasp. Her hands are slippery with blood, and they can no longer hold colonial possessions, secured by tyranny and retained by oppression. Whoever contrasts the glory of Spain at the time of the abdication of Charles V. with her present degradation will have a striking illustration of the operation of the law that only the fittest can survive. On the twenty-fifth of October, 1555, the eyes of the whole world rested on the scene in the hall of the great palace at Brussels when Charles the Fifth abdicated his throne. Brussels was then the gay capital of Brabant. Its gardens surrounded it with a sea of verdure; its streets rose on the sides of the hill like seats in an amphitheatre. In this historic hall were assembled warriors and knights resplendent in their robes, and famous for chivalry in battle and brilliancy in the court. Here was Egmont, the flower of Flemish chivalry; here was Horn, proud, sullen and defiant. Behold the mighty Charles entering the hall leaning on the shoulder of William, the Prince of Orange! Charles is but fifty-five years old, but his grossly wicked life has made him a feeble old man. His shoulders are bowed, and his legs are feeble. Never handsome, he is now positively ugly. His lower jaw so protrudes that his few remaining teeth make eating and speaking difficult. Near him is Philip, his son and successor. He has the enormous mouth and protruding jaw of his father, as well as that father's intense bigotry and inhuman intolerance. To Philip was given that day authority over the destinies of half the world, over Spain, over great parts of America, and soon, through the conquest of Portugal, parts of the East Indies and Africa. Into his hands were placed the destinies of one hundred millions of people, and of many additional millions then unborn. He was utterly unfit to rule these mighty nations. He possessed all the intolerance and bigotry of his father, and many vices to which his father was a stranger. Charles retired to the monastery of San Yuste, situated in a secluded region in the western part of Spain. While here he expressed the deepest regret that he did not burn Luther at Worms. He constantly urged Philip to use the utmost severity in dealing with heretics, conjuring him to cherish the "Holy Inquisition,' and adding, "So shall you have my blessing, and the Lord shall prosper all your undertakings." Prescott doubtless is right in affirming that Charles did more to fasten the yoke of superstition on the necks of the Spaniards than all other rulers. His example controlled the policy of the pitiless Philip II., and indirectly that of the imbecile Philip III. Philip's marriage with Mary Tudor made him king-consort of England. The mines of Mexico and Peru filled his coffers with steady streams of precious metals. He directed the creation of the so-called Invincible Armada, which attempted in 1588 the destruction of England. He intended to strike an absolutely decisive blow at Protestantism throughout the world. Pope Sixtus V. had made England over to him as his possession. His fleet consisted of 130 vessels, and was thus larger than had ever before been seen in Europe. The utmost consternation seized all ranks of people in England upon the news of the approach of this terrible armada. All honor to Howard, Drake, Hawkins and Frobisher. But all glory to God for the winds that blew and that sent so many of those ships to the bottom of the sea! Only fifty-three of the 130 ships returned to Spain. Well might Elizabeth strike a medal with the inscription, "Deus flavit, et dissipati sunt." "God blew, and they were scattered." In a room in the Escorial, Philip died a death similar to that of Herod as described in the Acts of the Apostles.

With the death of Philip II. closed that splendid and cruel era of Spanish history which began with the capture of Granada and the discovery of the New World. The imbecile Philip III. was so great a slave to form that he exposed himself to the heat of a strong fire, the servant whose duty it was to remove his chair being absent and etiquette forbidding the king to do it for himself, and so his death was caused prematurely. It was, perhaps, only a preliminary roast, still continued and well deserved.

Under Philip III. more than half a million of the Moors, or Moriscoes, Jews and Protestants, the most skillful and industrious inhabitants of the peninsula, were driven into exile. This act of bigotry was a fatal blow to many of the most prosperous provinces of Spain, and the empty dwellings and neglected fields in these districts bore sad and eloquent testimony to the folly and cruelty of such religious bigotry. No words can overstate the satanic crimes of Philip II. and Alva in the Netherlands; and these countries in 1609 virtually achieved their independence. In 1639 came the loss of Portugal. During the latter part of the seventeenth century Spain was involved in dangerous wars with France, and lost by various causes at least eight millions of her population. Then came the revolt of her American colonies; then in 1819 her cession of Florida to the United States. Spain is unfit to rule, and by the inevitable law of God in nature and providence she must be deprived of her rule. God is making the American people the rod of his righteous wrath to chastise this guilty nation.

The law of the survival of the fittest was conclusively illustrated in the destruction of the Canaanites by the Israelites. This event is often considered one of the difficulties of Scripture, but if the facts were fully understood the difficulty would entirely disappear. The Canaanites were not fit to survive. They were guilty of crimes which were long punishable by death in Great Britain and all her colonies. God wished to introduce a higher civilization than that of the Canaanites. He might have destroyed them by earthquake, by epidemic, or by the ordinary operation of natural law; but by using the Israelites as the instruments of his just wrath he the more fully showed his indignation against the sin of the Canaanites. The same law is revealed in the case of the American Indian. God wanted the American continent for the development of the greatest civilization of the modern world. In carrying out that plan the Indian must conform to civilization or be destroyed by civilization. This statement does not justify any cruelty on our part toward the Indian; but it emphasizes the universality and uniformity of God's great law in the management of the world. In harmony also with this law the aboriginal tribes of the peninsula of India were overcome by the conquering Aryans; so were the Finns supplanted by the Ayran races in Europe and Asia; and so the Tartars by the Russians, and the aborigines, as we have seen, in North America, and as we may see in Australia and New Zeland, by the Anglo-Saxon race. The whole history of Spain, the Iberian Peninsula, is an illustration of this law. In prehistoric times the Iberians had possession. Then came the Celts, and hence the Celt-Iberian. Then the Phœnician, and successively the Greek, the Carthagenian, the Roman, the Goth, the Moor, and finally the present heterogeneous Spanish nation.

The story of the conquest of Spain by the Moslems is one of the best historic examples of this law. Fifty years after the death of Mohammed his conquering standards were carried through Asia to the Hellespont, and through Africa to the Straits of Gibraltar. This great crescent lay along the southern shore of the Mediterranean, with one horn striving to push its way into Europe at the Hellespont and the other at Gibraltar. Thirty-six years after the death of Mohammed, or in the year 668, the Moslems laid siege to Constantinople, and for six years the siege continued with unflagging energy and heroic courage. But for the use of the bituminous compound called "Greek Fire," which was poured from the walls upon the scaling parties and carried to a distance by tipped arrows, or blown through tubes, the Arabs might have conquered, and the banner of Islam might have waved over Europe and finally over America. But the fierce and uncontrollable flame of the Greek Fire was too much even for Moslem courage and zeal. But although repulsed at the eastern extremity of Europe, the Moslems found its gates open by treachery at the western extremity; and it is said that Count Julian was the Judas who betrayed his country into the hands of the Moslems. Roderic, the last Visigothic king of Spain, entrusted Julian with the command of the fortress of Ceuta, which guarded the Straits of Gibraltar; and he surrendered his post to Musa, the Mohammedan governor of Africa. In 711 Tarik effected an entrance into Europe, landing at a point which to this hour preserves his name in the word Gibraltar, Gibel-al-Tarik, meaning "Mount of Tarik." The Gothic people, who more than two centuries before had conquered Spain, had lost their bravery, and had become assimilated to the Latin-speaking provincials of the Peninsula. Roderic entered upon battle wearing silken robes, crowned with a diadem, and borne in an ivory chariot drawn by white mules. Disaffection alienated his chiefs; and his army, after a battle of seven days, was partly overcome by the enemy, and the remainder of his troops abandoned the field in disgraceful flight. Roderic himself was drowned while cross the Guadalquivir. Thus perished the last of the Gothic kings, and thus triumphed the Moors. Cordova, Toledo and all of the chief cities were soon in their possession, and for nearly eight hundred years they were rulers over a great part of Spain. The Visigoths were a dying race; they were unworthy to survive, and they therefore perished.

In the destruction of the Moors and the triumph of the Spaniards in 1492 the same law was again illustrated. In 1469 Ferdinand of Aragon was married to Isabella of Castile; in 1479 these two states were united in a single kingdom, and in 1492 came the conquest of Granada. The Mohammedan was at that time reduced to a limited dominion; but the provinces of Granada, by the skill of the Moors, was one of the richest districts of Spain. Besides Granada, its potent and opulent capital, the district embraced seventy walled towns. Terrific was the battle of Granada. The Moors were weakened by internal dissensions, as were the Goths, who eight centuries before they had conquered. Glorious was the victory of Spain, when Cardinal Mendoza, climbing one of the historic towers of the Alhambra, waved the banner of Spain and shouted, "Granada is taken, Granada is taken." We have already seen that almost immediately upon reaching the zenith of her power and glory Spain began the downward course which has now well-nigh reached its nadir. The establishment of the inquisition, the neglect of wholesome industries at home because of the exaggerted reports of Golcondas in newly-discovered islands and continents, the loss of the youth of the country who in a spiirit of adventure went to the lands recently acquired, the banishment of the Protestants, Jews and Moors who had not been cruelly put to death by the officers of the Inquisition, all these things hastened the downfall of Spain, until her name has become a by-word and hissing among the nations of the earth. No nation, no church, no man can escape the operation of this great and universal law as to the survival of the fittest. Only as by the observance of righteous laws, human and divine, we prove our worth, can we expect to survive in the terrific competitions of the time and the fearful conflicts of the ambitious nations of the earth. The nation which will not obey the laws of the highest civilization of the time will by that very civilization be utterly destroyed.

One result of the war will be a virtual, if not a formal, Anglo-Saxon alliance. The recent speech of Mr. Chamberlain has made a sensation throughout the civilized world. He has made not only all the Latins but even the Teutons anxious as to their future. The best classes, both in Great Britain and the United States, will hail with joy this sympathetic alliance. The queen's birthday awakens an enthusiasm in the United States second only to that evoked in Great Britain and her colonies. It was an American who spoke of "the womanliness of the queen and the queenliness of the woman." It was an American who gave us the toast, "Victoria, queen of Great Britain and Ireland, empress of India, and woman of the world." In her pure and noble womanhood she is queen of all pure and noble hearts in all parts of the world. This Anglo-Saxon alliance will not be of the nature of the so-called Holy Alliance, the Kaiserbund, or the Dreibund. But it will be an alliance for peace and not for war; an alliance for liberty and not for tyranny; an alliance for all that is noblest in human government and divinest in human liberty and progress.

Another result of this war will be that the American Republic will come up to its great place in the congress of nations. This nation has now reached its majority; it will never again go back to childhood. It must take its place in bearing the responsibilities and discharging the obligations of the leading nations of the world. We have too long striven to be an isolated people. George Washington was one of the greatest men of the human race, but he was not omniscient. We have often made his farewell address a sort of fetich. He spoke according to his light, as all men must speak. But he could not conceive of the greatness of the republic whose foundations he so nobly laid. In his day Liverpool was farther from Washington than is Calcutta or Bombay in our day. In his day Boston was farther from New York than is London or Liverpool in our day. He could not conceive of a time when railways, telegraphs and telephones would unite continents and make a whispering gallery of the world. We do well, indeed, to avoid the entangling alliances which he feared; but we shall do ill if we shirk the solemn and sublime obligations which we must now assume. We have too much left Great Britain to fight alone the world's battles. Henceforth the beautiful daughter must nobly stand by her queenly mother. Matthew Arnold set forth the thought that Great Britain is overburdened with the care of empire. He described her as a "weary Titan"—

> Bearing on shoulders immense,
> Atlantean, the load,
> Well-nigh not to be borne,
> Of the too vast orb of her fate.

We shall respond to the call to share in bearing this burden and in rejoicing in these honors. The Anglo-Saxon is the great colonizing race; it is also the great missionary race. Great Britain has been the most potent missionary nation in the world. Her rule in Egypt and India has brought, with its acknowledged evils, untold blessings to many tribes and peoples. Her colonies, compared with those of France, Germany and Russia, are abodes of prosperity and peace. Wherever her flag has gone there law, liberty, civilization and Christianity are found. Her "far-flung battle line" is the symbol of peaceful possession and prosperous enterprise. She is illuminating the dark places of the earth. We need not hesitate to take our place loyally by her side. The heroic days of the American Republic are still to come. Great problems are demanding solution, and we must not fear the task of bravely meeting these problems. Our young men sometimes think that the glorious days of the republic were the times of Washington and Lincoln. But greater questions than either Washington or Lincoln ever dreamed of are soon to be asked and answered by the American people. We want statesmen who shall take their places beside the noblest Americans whose names shall shine forever as stars in the firmament of our history. Never did we need such statesmen more than we shall need them in the near future. Perhaps we ought not to bring politics into religion in the technical sense of these terms, but it is certain that we must put religion into politics in the true meaning of both these terms.

We shall not shrink from the new and enlarged mission which the providence of God is opening to the thought and duty of the American people. We have a message to all the nations of the earth. Every stripe in our flag is a herald of human equality; and every star is an evangelist of civil and religious liberty around the globe. We must push out into the Pacific Ocean. The Hawaiian Islands lie like a necklace of pearls on the bosom of that emerald sea; that necklace, by the alchemy of American patriotism and by the mercy of divine Providence, will be transformed into a star in the American flag. And we may yet have other islands in that sea as stepping-stones to our possessions in the far East. We must speak our word with reference to the dismemberment of China; we are entitled to all the commercial privileges that China grants to all other peoples. Our trade with China now amounts to $20,000,000 annually, and it will soon increase to $100,000,000 annually. We need a naval base in the Orient; and we may yet require a squadron in Eastern waters sufficiently strong to oblige all nations to respect our rights. Backed by Great Britain and Japan, we must utter our protest against the selfish schemes of France, Germany and Russia in the Orient.

These new problems will develop new resources on the part of our people. They will lead us away from the schemes of petty politicians who are seeking simply place and power. They will tend to the development of a true civil service reform, of a virile statesmanship, and of a world-wide Americanism. The golden age of our politics is thus in the future. Let those deride who will, but some of us dare believe that a new era has dawned, that new issues have come, that a larger place in the world's history is to be ours, and that a fuller American patriotism and a nobler American citizenship than we have ever known will soon be realized. If this be the romance of dreamers, it is a blessed romance; but it is rather the sober truth of sound reason and the forecast of true American patriotism and Christian enthusiasm. Americans can never, like the Chinese, allow themselves to become a stagnant people. The Chinese empire has had peace for centuries, but it has been the peace of the cemetery. China has been a dead sea and even a stagnant ocean. Certain doctrinaires in America, if their voices were heeded, would give America a similar isolation and stagnation. We must not listen to this selfish philosophy and this degenerate religion. It is the language of lotus eaters rather than of men whose spirits are fed by American patriotism. Great racial movements marked the close of the ninth century; so they may mark the close of the nineteenth century. The first duty of the Anglo-Saxon people is union in all parts of the world. Perhaps there may yet be a conflict between the Slavic nations and the Anglo-Saxon peoples. Russia has already hypnotized and paralyzed great portions of Europe and Asia. The battle royal of the world will be fought when mighty Russia and mightier Britain meet in terrific shock in some Armageddon. If that day shall come, God grant that the beautiful American daughter may bravely stand beside her noble British mother.

Out of such a union will come civil and religious liberty in the Philippines, in Cuba, and, finally, in Spain and throughout the world. Then the glorious gospel shall be preached in every part of Cuba, and then the song of liberty shall be sung to the music of the Southern sea breaking on the Cuban shores as its divine accompaniment.

Paper Trades Association of Europe.

BY J. R. MACNEILLE.

There are three things of first interest in connection with this subject: What associations there are, what they do, and how they resemble or differ from the American associations of national importance, the Paper Makers' Association, the Stationers and Paper Manufacturers' Provident Society.

Scotland has one, the Scottish Paper Makers' Association.

France has four, the Syndical Chamber of Manufacturers of Paper, the Union of French Paper Makers, the Syndical Chamber of Wholesale Paper Dealers, and the Syndical Chamber of French Paper Makers and Dealers.

Germany has six, the Union of German Paper Makers, the Paper Makers' Association, the Paper Manufacturers' Association, the Union of German Pulp Manufacturers, the Provident Society of the German Paper Industry, and the German Paper Union.

Austria-Hungary has two, the Union of Austro-Hungarian Paper Manufacturers and the Association of the Paper and Stationery Trades of Austria.

Finland has two.

Scandinavia has two.

The Paper Makers' Association, founded in 1872, the national organization of Great Britain, is designed to promote and protect the general interests of paper makers, to promote and support the passage through Parliament of any bill comprehending the above, to take such steps as may be deemed desirable to oppose fiscal or other legislation likely to be injurious to paper makers, and to assst in any litigation by which the general interests of paper makers are, in the opinion of the committee, affected. The association have a firmly adopted code of trade customs and regulations which are generally adhered to, which includes regulations relating to materials used in manufacture, to orders for the manufacture of special makes, to variations in weight and measurements, to the count and quality of sheet papers made by any machine, to the mode of wrapping up,

to the way in which paper is sold, to the terms of payment, and to the returning of empty packing cases. These regulations comprehend the recognized customs of the paper making trade, provided no agreement is made at the time of the order between the vendor and the purchaser. The headquarters are in London. There is a territorial division into the northern and the southern committees. Membership dues are scaled in proportion to the importance as a manufacturer and as a member.

The British Wood Pulp Association define as their principal object, the furthering of the interests of the wood pulp trade by friendly intercourse and interchange of information and views, the establishing of relations with kindred associations at home and abroad, the recommending and adopting of a uniform contract note and a uniform system of drawing and testing the samples; the bringing pressure by combined action to bear on railway and dock companies, steamship owners, wharfingers, lightermen and others, in order to secure advantageous rates and charges; the assisting in any litigation by which the general interests of wood pulp importers are, in the opinion of the committees, affected; the compiling and issuing of statistice relating to the trade. Membership in the association is limited to bona fide agents and merchants in wood pulp; the dues are $5 yearly. The headquarters are in London.

The Scottish Paper Manufacturers' Association has its headquarters in Edinburgh.

The Stationers and Paper Manufacturers' Provident Society, established in 1839, has its headquarters in London. Its objects are the raising of funds to be applied for the benefit of paper manufacturers, stationers and in general of those connected with these trades.

There are in Great Britain 54 trades unions connected with the paper and stationery trades, 350 branches, and a membership of 52,600. The most prominent of these unions are: "The Original Society of Paper Makers," founded in 1800, membership 600; "The London Paper Stainers' Union," founded in 1861; "The Amalgamated Paper Makers," 850 members; "The National Union of Paper Mill Workers," founded in 1890. This union has some thirty branches. The membership is about 1,500. One feature is a system of benefits to employed members. "The United Vellum and Parchment Makers of Great Britain," founded in 1872.

The French Syndical Chamber of Manufacturers of Paper and others connected with the industries employed in its transformation, was founded in 1861. Membership, active, 400, including corresponding members. It represents the general interests of the paper and pasteboard industry atached to the National Union or general syndicate of France. Members have all privileges of all departments of said National Union free, with special privileges in addition. These include "Department of Commercial Information," 20 per cent. discount and free book coupons for payment of regular fees, department of insurance, consultation free, and the verification of insurance policies free. Department of contested claims, consultation free. Free and generally satisfactory arbitration. Department of patents and trade marks, consultation free. Department of railroads, verification of way bills, free. Consultation free. Only in case of rebate of fifty per cent. is any money allowed the department by a member.

Department of Taxes. Full verification of tax lists. When there is cause for a claim a member allows the department forty per cent. of the rebate obtained by its aid. Department for verification of bils, department of translation, special department of acounts, free subscription to Paper Makers' Journal, official bulletin of the Syndical Chamber of France. National Union. The annual of the Syndical Chambers. Arbitrators appointed by the Chamber, approved by the Tribunal of Commerce, are charged with inquiries into disputes arising in the paper trade, which disputes are referred to them by the presidents of said tribunals. Every year numerous cases are submitted to them, and for the most part are amicably settled. The Chamber has been instrumental in founding "The Mixed Council of Paper Makers," employers and employes, the mutual aid society of paper makers.

The institution for the encouragment of the children of the stained paper industry, 1864.

The institution for the encouragement of the paper and pasteboard trade apprentices, 1868. The faculty includes thirteen professors. Some features are an elaborate list of annual prizes for excellence in the different classes, workshops; with all the necesary plants for paper and pastboard making. The annual meetings are attended by many prominent members of the government, including members of the Cabinet. The Union of Manufacturers of Paper of France, established 1864; headquarters at Paris; publishers of Monitor of the French paper industry. All manuufacturers of paper and cardboard are eligible. The object is to safeguard the general interests of the French paper industry; to establish fraternal relations between the manufacturers. The government is by territorial committees and a central committee, each with its own organization. The central committee reserves to itself the power to demand a special study on any question of general interest or importance. It also frequently calls for special statistical reports. It corresponds with territorial committees, collects and co-ordinates their reports, selects and publishes the desirable ones. It has charge of funds, controls expenditures, directs publication of the official organ of the association, published each fifteen days, which is sent free to all members. The said Central Committee meets at Paris once a month. Extra sessions may be and are held. An annual general assembly is held in the spring in Paris. Reports of all the doings of the union, and papers giving the results of special investigations and study ordered by the union the previous year. Said assembly is composed exclusively of members. Admissions limited to those with certificates. Each firm has one vote, and the president may invite, on his personal responsibility, any one having a communication of importance to the paper industry.

The organization of the Austro-Hungarian Paper Makers' Association is the result of the experience of many years. The peculiar conditions of the paper industry in the empire and the association laws obtaining there form the frame of this organization, which has experienced various changes in the course of years. The necessary impulse to the establishment of the association was given by the political, economical and commercial conditions which prevailed in the empire at the beginning of the seventies. The rapid national progress which brought about the catastrophe of 1873 had also brought the industry under its nefarious influence. Notwithstanding the gradual increase of exports, the accumulation of stocks and the continual drop in the price of the manufactured products soon brought the manufacturers to realize that the direction taken by the production was not a healthy one; that from necessity overproduction seemed unlikely to depress the prosperity of the industry. The association was to supply the means of bringing about undertakings regarding the prices of manufactured products and terms of sale. This object was not accomplished by the young association. It was impossible to secure a consensus of opinion of the different members. The association lacked altogether a legal status for transactions of that kind. The existing laws did not make it possible to establish a suit on these questions. The direction of the association did not possess the right to enforce obligations of a pecuniary nature on the members, and so, without binding agreements, did not succeed in changing conditions. To this day the efforts of the association in that field have remained rather fruitless.

Another field of work has proved very fruitful. At the first meeting the members recognized the great value which might accrue to the paper industry from its taking its place in the discussion of all commercial, political, economical and technical trade questions. They placed great hopes on the influence which the organization might exert upon the solution of those problems through the state's power and legislative bodies. Their expectations have been realized for the most part. In 1881 the association was reorganized. The name of the association remained, but its object was enlarged and extended to benefit the whole paper industry and its kindred branches, with representation in every direction, and separate improvements were made the special purpose of the association. There are seven sections:

1. Manufacturers of wood material or wood pulp.
2. Wood cellulose or sulphite manufacturers.
3. Straw paper manufacturers.
4. Manilla paper manufacturers.
5. Manufacturers of paper free from wood.
6. Manufacturers of cellulose paper.
7. Manufacturers of book and printing paper.

Each one has a directory committee of three to five members, with a chairman at its head. The annual dues, fixed in accordance with the number of paper or wet machines, are estimated by the general meeting, which takes place in May or June of each year. Since its foundation the association has been constantly opposing the interests unfavorably disposed towards the paper industry in Austria-Hungary and assiduously, yet quietly, laboring for the weal and prosperity of the said industry.

It is an established fact in mechanical engineering that there is little economy in the use of small steam engines. Indeed, such engines are positively wasteful, and are not economical even when used for driving paper machines where something can be sacrificed for steadiness of speed. Even in this case a very large compound condensing steam engine is to be preferred instead of a number of small engines. The paper machines may be connected through friction clutches, and all the machinery driven from one main shaft. The speed regulation of a large steam engine will be all that can be desired provided it is not overloaded. Thus steady speed and close economy may be obtained.

Messrs. T. J. Marshall & Co., of Stoke Newington, London, N., send us a beautiful example of watermarking in the shape of a calendar, embellished with a picture, well executed, representing the work of their patent metallic watermarking. The design is produced on a sheet of handmade paper, and there can be little doubt that it is one of the finest, if not the finest, specimens of the watermarking art extant, and represents Britannia and other symbolic figures.

The statement has been made that the American patent system is developed to higher perfection than that of any other country in the world. And yet the best American patent ever issued only entitles the holder to fight out his claims in a United States court. That is all. A patent does not secure him anything else, or even that, if declared invalid by the selfsame court. Give us patents that warrant and defend!

A German patent, issued to H. A. Schoeller, Duren, is for a stone couch roll on which no jacket is required.

PAPER-MAKERS' QUIZ.*

[WRITTEN FOR THE PAPER TRADE JOURNAL.]

By James F. Hobart, M. E.

Question.—S. D. J., Scitica, Conn., asks: "What is the best material to use for packing diaphragm screens? Have been using leather, which cracks in a short time."

Answer.—Leather answers fairly well, if tanned specially for the purpose of diaphragms. The cracking above referred to is caused principally by over-tanning or too quick a process of tanning being used. Untanned skin—rawhide—makes an excellent diaphragm, but it is liable to decompose, become rotten, under certain conditions; therefore is not desirable for the purpose.

Rubber diaphragms are subject to the same ills that affect leather ones. It seems as if pure gum rubber would make an ideal diaphragm, and it would but for the fact that there is no certainty that the rubber would stay in shape under variations of temperature. It is to this end that rubber is mixed with sulphur and heated to a certain point—vulcanized in fact—and if vulcanized too much the rubber soon cracks. Sheet rubber, if vulcanized especially therefor, makes a good diaphragm.

Question.—B. B. M., New York, asks: "Can you give me the name and address of pulp or paper manufacturers who make pressed paper, such as is used in car wheels?"

Answer.—Paper is not pressed until put into the wheel; that is, it is made the same as any ordinary paper and then pressed into the wheel. For this reason any paper can be made into car wheels, although certain qualities of paper stand better than others. If manufacturers who make paper for this purpose will communicate the fact to Quiz, their epistles will be forwarded to the questioner.

Question—A. B. C., Detroit, Mich., writes: "What is the true status of the roller bearing for paper mill use? I have heard a good deal in favor of and considerable against the use of such bearings for shafting, beating engines, calenders and all heavy machines. What is the true inwardness of this matter?"

Answer.—I find that, like everything else, the roller bearing works well when well taken care of, and is of as little benefit as any other device when neglected. When properly made, applied and taken care of, roller bearings save from 15 to 25 per cent. of the power applied to beating engines. On line shafting the conditions are excellent for using roller bearings, and they invariably show a good saving of power. I am aware of a few failures, but seemingly in every instance the lack of success could be traced either to a wrong application of adjustment of the roller bearing, to a prejudice of some one in authority or in charge of the device, or, as is more apt to be the case, to the improper design or poor workmanship of the bearing.

It must be stated that the design of roller bearings is not what it should be. The engineer wishes to make the rolls large to diminshes the number of times of contact, diminshes the number of times of contact, which support the journal. It must be remembered that ball bearings support the weight upon a series of points. Roll bearings increase the support by substituting lines for points, and the larger the rolls the less the bearing surface to support the revolving journal. Another apparent defect is in the cage which keeps the rolls in line with the journal. This should not be rigid; it should guide the rolls, not force them, hence the need of a certain elasticity in the cage. Another defect is the placing of the cage bars between the rolls instead of inside them.

The writer has seen roller bearings in use on beating engines which have done their whole duty without the least trouble from the day they were put on and started up. Other roller bearings have given trouble continually; the evidence in each case indicates that, properly made, applied and taken care of, the roller bearing is a very good thing. Otherwise, they are a nuisance. The present status of the roller bearing is, then, that they can be improved in design and in manufacture; also greatly benefited in some instances by better care in their use.

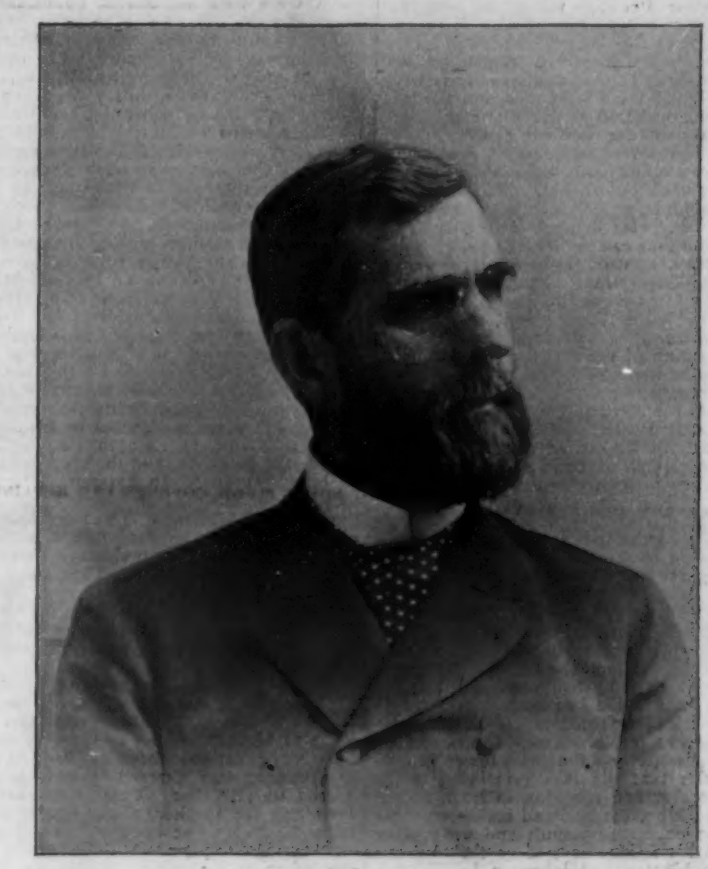
S. S. A., Jersey City, N. J., writes—1. "How much more power will a plunger pump take than a piston pump, and what is the reason?" 2. "I am troubled badly when we furnish our heaters with the stock blocking in front of the roll. This is worse since we put in new plates, three months ago. I have an idea that a wood lining would help matters if made so as to slope gradually up to the plate. Would that answer, or is something else the matter?"

Answer.—1. A plunger pump takes more power than a piston pump in one way, while in another it takes less. The pump itself moves easier when made with a plunger because there is only the friction of the packing in the stuffing box (neglecting the water) to work against. In a piston pump there is the friction of the rod through its packing, which corresponds to the friction of the plunger, and there is also the friction of the piston, which is considerable if the rings are set tight. On the other hand, the plunger pump is single acting. It only takes water on the out stroke, therefore it must make twice the number of strokes to do the work of a piston pump with equal displacement. Hence, it will be seen that the piston pump really takes less power to raise a given quantity of water, although it actually requires more power to run it than is needed for a plunger pump.

2. The wooden lining mentioned is just what is needed, or, better yet, put in a sheet of brass or copper and pack up to it so the edge of plate will not offer a sort of ledge to catch and hold stock.

*Members of the trade, in all its departments, are invited to ask questions, replies to which will be printed in this column.

Henry Van L. Myer has been admitted as a partner to the firm of Augustine J. Smith & Co., wholesale paper dealers, 132 Nassau street, New York.



Ex-Governor P. C. Cheney.
The new President of the American Paper and Pulp Association.

MIAMI VALLEY.

[FROM OUR REGULAR CORRESPONDENT.]

Dayton, Ohio, February 15, 1899.

John A. Shibley, of New York, and H. M. Davis, of Boston, promoters of the proposed combine of writing-paper manufacturers, were in the valley this week, and as a result talk of the possibilities of the consolidation of these plants was considerably revived.

It is known that the gentlemen visited the members of the trade interested in this section, though 'tis said that they did not meet with the reception which might have been expected.

They registered at the Atlas and left shortly thereafter for West Carrollton and Franklin. A half-day was spent at the hotel, and Messrs. Shibley and Davis were busily engaged explaining the details of their plans to local manufacturers, but it is not thought final arrangements were perfected. They refused to say anything when approached by the writer, evidently feeling that their job of elucidating to their callers in the persons of mill-owners was a heavier task than they had anticipated, and should, consequently, occupy their entire time. Plans of the proposed pool are generally known in the trade.

The promoters have not met with the encouragement and support expected in the West up to this time, though just what progress will be made before the month ends cannot be predicted.

They reserved sleepers for the East, but may shortly visit the Fox River Valley again.

It is not thought much ulterior attention will be accorded the project if plans are not soon consummated.

The Champion Coated Paper Company's plant is located in Hamilton, and the intimation that it was a Dayton concern in the bulletin respecting its proposed improvement, last week, was misleading. The telegrapher is naturally blamed for the discrepancy.

Middletown, the "paper city," thus analogously dubbed with Holyoke, is experiencing a large-sized boom. All of its seven paper mills are running full forces on long schedules, while the tobacco factories are humming industriously.

This company is now employing 300 people and has been running its plant night and day in order to meet the demand. It has been apparent for some time that a greater capacity is needed, and the only way to meet the requirement, it was decided, was to build a new factory. But this extension must be near the present factory, and in order to make the improvement a certainty it was necessary to secure permission from the board of control, which granted the vacation of a section of a street and an alley for the purpose.

The capacity of the mill will be doubled, and while it is hardly probable that a duplicate of the present mill will be constructed, the addition will be sufficiently large. The working force will be largely increased.

Work on the new buildings will begin as soon as practicable, and the city clerk has been authorized to advertise the petition, and all legal steps will be taken for the vacation of the thoroughfares.

Sarah McKnight has brought an action in the Common Pleas Court of Butler county to set aside an entry compromising her suit against the administrator of the estate of the late Edward J. Snider, of the Louis Snider's Sons Paper Company, claiming that the entry was filed on March 4, 1898, without her knowledge or consent. She asks that the original suit for $1,579 and interest be restored to the trial docket.

The court has taken under advisement the testimony in the case of the Merchants' National Bank of Middletown against the Jacoby Paper Company. The bank is not the only plaintiff. In conjunction with John Auer and Frank H. Roy, however, it held $75,000 of the bonds of the defendant company. It claimed to have a judgment aggregating $40,000 against the paper company.

The Hinckley Fibre Company and other unsecured creditors attack the validity of the mortgage and judgment, on the ground that the mortgages are invalid under the laws of Ohio, and that judgments constitute a fradulent preference also under the laws of this State.

It is probable a reappraisement of the A. L. S. Campbell estate will be made. The property was originally valued at $177,000, and it is asserted that the valuation is excessive and will prevent the sale of the same.

Hon. John A. McMahon, of McMahon & McMahon, this city, and Shotts, Millikin & Millikin, of Hamilton, and Judge Dechant, of Middletown, represent the secured creditors, while Morey, Andrews & Morey and Belden & Fitton represent the unsecured creditors. M. V.

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Answers can come in our care and will be promptly forwarded without extra charge.

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SITUATION WANTED—BY SUPERINTENDent of fine mill; ten years' experience in making all varieties of fine papers; best of references. Address MIAMI, care Paper Trade Journal.

WANTED—POSITION AS FOURDRINIER machine tender; used to running large machine on print, also on book, writing and manilla; A1 references; married. Address S. S. S., care Journal.

WANTED—POSITION AS FOREMAN OF mill; day or night boss; well up on all grades of stock and colors; steady, sober man. Address RELIABLE, care Journal.

WANTED—POSITION AS MACHINE TENDer; accustomed to cylinder, Harper or straight machines; married and sober; good references. Address B. A., care Journal.

WANTED—BY A PRACTICAL PAPER maker, position as superintendent or foreman in a paper or sulphite mill; twenty-two years' experience in the manufacture of book, news, writing, and heavy and light manillas; best of references as to character and ability. Address FIBRE, care Journal.

WANTED—A MAN TO TAKE CHARGE OF the coating room for a factory that makes all grades of surface-coated papers and cardboards; only competent hands need apply. Address A. B., care Paper Trade Journal office, New York.

FOREMAN WANTS POSITION—EXPERIenced on news board, strawboard, butchers' manillas, tissues, copying and felt papers; good reference. Address BOX 321, Lambertville, N. J.

WANTED—A CYLINDER MOULD 72 TO 76 inches broad; state best price f. o. b. and condition of mould. Address M., care Paper Trade Journal.

WANTED—POSITION AS FIRST-CLASS Fourdrinier machine tender on book, news or manilla; fifteen years' experience; best references. Address J. M. C., care Paper Trade Journal.

WANTED—SECOND-HAND FIVE-DRYER sheet lining machine, 36x48-inch dryer; must be in first-class condition. Address, naming best cash price, CHICAGO STRAW BOARD CO., Chicago, Ill.

SALESMEN WANTED IN NEW YORK CITY to handle product of a large mill. Address T. R., care Paper Trade Journal.

MACHINE TENDER WOULD LIKE POSItion; eleven years' experience; news, manillas or tissue; used to fast running; can furnish reference; steady, good habits. Address BRONSON, care Journal.

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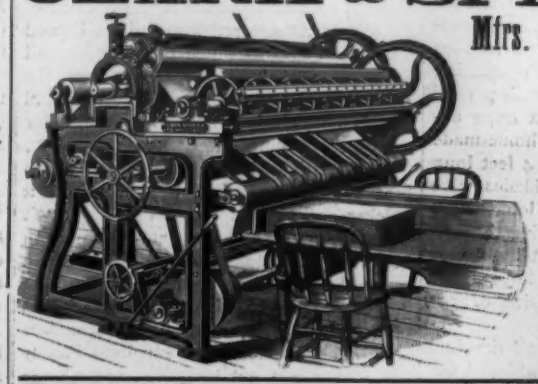

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TO THE TRADE.

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ONE TESTIMONIAL OF MANY.

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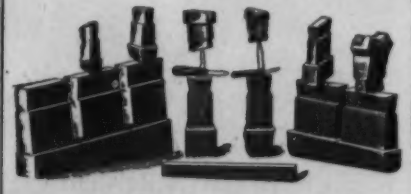

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DUNDEE, Scotland.

AMONG THE MILLS.

[BY A STAFF CORRESPONDENT.]

NEW YORK CITY, February 16, 1899.

A duster that stands over anything I have ever seen in that line for extracting ALL the dust and as little of the fibre as possible resembles pretty closely a common railroad duster. But there is a difference, and a big one, too. The ordinary railroad form of duster is so built with low partitions or "back-falls" between the spiked rolls that the first roll, if one of the spikes should happen to strike a rag just right, could knock it clear through the duster and out on to the floor. This cannot be done in the form of duster I am about to describe. The rolls are farther apart, and the wire-netting partitions or "back-falls" between the rolls come up higher than the centre of the rolls. And then the curb segments come down so low that there is a pretty small passage for the rags from one roll to the other. The result is that the rags stay quite a while in the compartment belonging to each roll, and as the space gets well filled the rags are driven over faster than when there are only a few rags in the machine. The rags are cut before being put through this machine.

There is a space on top of each curb which is covered with pretty fine wire netting, and is also furnished with a wooden slide or cover, which can close the opening completely. The entire underneath part of the duster is connected with a large exhaust fan blower, which is a home-made concern. The blower is about 4 feet long and 3 feet in diameter. The blades were made of thin wooden strips as long as the blower and 10 inches wide, leaving the outlet 16 inches in diameter. But both ends of the blower are connected to the exhaust pipe leading from the under side of the duster.

In operation the fan draws all the dust from the duster as fast as it is whipped out of the rags. The slides on top of the curbs are opened as far as found necessary, so that fresh air is admitted directly into each roll chamber. In this manner the duster does not have to depend upon the air that might be drawn in at the ends of the machine, but a supply is drawn through right where the dust is being threshed out, the result of the whole combination being to hold the rags on the rolls for a considerable time, during which they are being vigorously whipped, and at the same time a powerful stream of air is being drawn through, removing the dust as fast as taken from the rags. One good thing is that there is never any dust either in the room or around the duster. It is all carried off slick and clean. As the rags are not passed the entire length of the duster in a dust-laden atmosphere, but in clean air, they must come out very clean—and they do.

The speed of the fan is to be regulated to give just the amount of suction needed. Probably the speed will have to be about 500 revolutions of the fan shaft per minute. The wooden fans above described are supported on three or four cast-iron spiders, which in turn are fitted to the shaft and slipped thereon. A feather keeps the arms in line, and some set-screws prevent end movement of the fan. Sometimes the fan is put together and slipped on the shaft without any feather. Then the set-screws are tightened down against the shaft so as to leave a mark. Then the fan is removed and holes cut or drilled for the ends of the set-screws.

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Another time this same concern tried to beat sponge, and they wanted to do it quicker. The old paper maker wasn't there any more, and the young fellow who held his place sent out and bought a second-hand Jordan engine. This machine had to be chipped, of course, before it was put to work, and quite a number of dollars were expended for other repairs. Finally the Jordan was got to going, and sponge furnished to it without any preliminary treatment whatever, except soaking. The result can well be imagined. In two hours the filling was torn out of the shell, and in two days that Jordan stood out in the mill yard —"For sale at a reduced price!"

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Speaking of beating sponge in a Downingtown duplex beater brings sharply to mind a mill where they once tried to make asbestos paper stuff with a pair of these same beaters. But asbestos is stuff that wants about as good beaters as are required for sponge; in fact, it doesn't want beating at all, and I believe a plain cast-iron bed plate and thick worn-out bars are just the things for pulping asbestos. Of course, we have to use beating engines for this purpose, but it is done for the want of better machinery for the purpose. A beating engine is not fit for making paper pulp of asbestos; that fibre doesn't want to be cut in the least. Instead, the fibre wants to be mashed or hammered to pieces as much as possible sidewise, but not shortened in the least.

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In my estimation, the pieces of old iron now used should be no longer tolerated. Instead, each stock of calenders should be fitted with a pneumatic cylinder and connected with a supply of compressed air; then, in an instant, as a man springs to catch the paper that is tumbling out upon the machine room floor at the rate of five miles an hour, a single touch of the finger against a valve would shut off the air and lay the stock of calenders lightly one upon another. The paper faced through again, a similar touch would restore the pressure without shock or delay.

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And this man should have at least two pneumatic cylinders, also attached to trolley tracks and connected by hose with the air supply. If you could see a finisher handle 500-pound rolls with this rig—see him tip them up, one end after the other, with the touch of a finger, and see him finish the biggest roll without denting the end or hardly bulging the wrapper; if you should see him do this so easy just once there would be no such thing as hiring you to get along without compressed air—and plenty of it too—in all parts of the machine room.

Perhaps you don't know it, but some compressed air released in the stuff on hot days as it comes on the machine will lower the temperature so that those delicate color shades can be handled with ease.

In a mill where a man had recently been killed by getting caught in the shafting I found considerable anxiety to prevent, if possible, a future accident of this kind, and the management of the mill had been investigating the matter of putting in stops whereby the entire mill or any portion thereof could at once be stopped by simply pressing a button. There are several instruments on the market—some of them simple, others complicated—for stopping a steam engine from any part of the mill without action by the engineer. Some of these instruments work by compressed air, some by electricity, and some by other means. Some of the best work by means of a weight, the action of which is controlled by electricity. In the mill in question they had already in use a system of electric signals for stopping and starting the power, slowing down, etc. In putting in the new system the old apparatus was allowed to remain complete, and another wire was run all through the mill, close beside the two original wires. Between one old wire and the new one the stop push buttons were arranged, leaving the old buttons for their usual work of stopping, starting, etc.

The new stop is applied to the throttle, or, in the case of the new makes of Corliss and some other engines, to the disconnection of the valve movements, thus cutting off steam instantly and letting the engine stop as quick as the momentum of the moving machinery would allow. In this case, relief valves were placed on either end of the cylinder for fear that the steam or air contained in the cylinder might be compressed up to a dangerous pressure by the fast-moving piston with the valves all closed through the sudden disconnecting of the valve gear.

The addition of another wire to the signal system virtually made a three-wire system of it, and the same battery was used for both sides of the wiring, the old and the new. The middle wire was connected to one terminal of the battery; the other terminal to the other two outside wires. The "emergency" push buttons were covered with bits of glass, to be broken when there was an accident. For this purpose a little cast iron ball, attached to the end of a short string, was suspended beside each signal button for the breaking of the glass without delay in hunting up something for that purpose.

The "electric engine stop," or any other engine stop for that matter, may be applied to water wheels as well as to steam engines. They may also be attached to friction and other forms of cut-off couplings so that a shaft or a section of the power distribution may be stopped at will without closing down the whole mill. These instruments may also be applied to the starting of machinery as well as the stopping, and fire pumps can be controlled in this manner. Two of the "stops" attached to the same machine will allow it to be both started and stopped again at will, and by the use of a small electric motor for the power application the action may be repeated indefinitely.

It was my intention to have made a flying visit to Charles River for the purpose of noting whether or not the would-be paper mill at that place is getting on. It is a slow job for one man to build a paper mill and do all the work himself; still, I don't know but it is a pretty good way as things go nowadays. It gives the owner—who, by the way, is building the mill—something to do, and puts off as long as possible the evil day when the mill will be running and the owner must rustle for orders. By the "self-building" plan the owner knows just where his money goes and how it was expended. He also knows that there is no poor work or material smuggled into the mill—without his knowing it.

It may be that the mill at Charles River, Mass., was never intended for the making of paper for the trade. When the mill is finished, early in the coming century, the trade may one morning be startled to the very centre by the announcement that Mr. Brown has established in his Charles River mill the very latest thing in the line of correspondence schools, and will henceforth teach by mail "The Art of Mill-Building at Home, or Every Man His Own Paper Mill Constructor."

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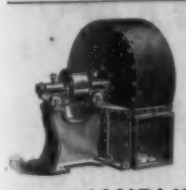

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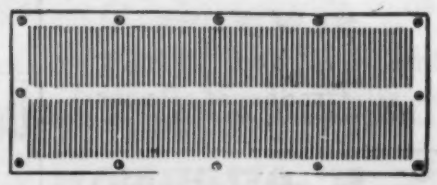

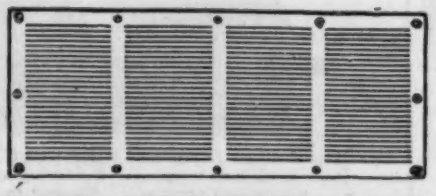

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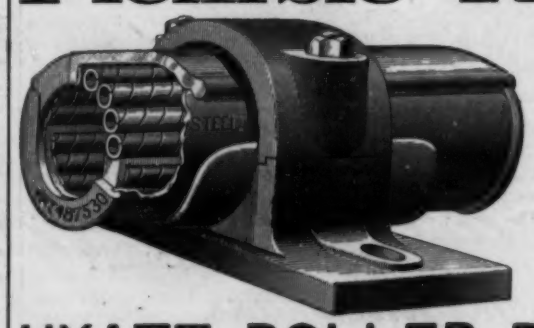

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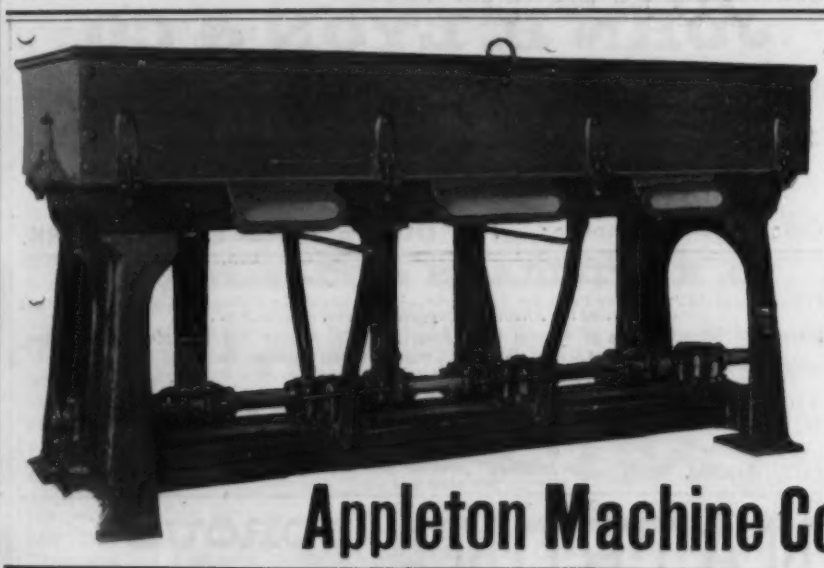

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And this man should have at least two pneumatic cylinders, also attached to trolley tracks and connected by hose with the air supply. If you could see a finisher handle 500-pound rolls with this rig—see him tip them up, one end after the other, with the touch of a finger, and see him finish the biggest roll without denting the end or hardly bulging the wrapper; if you should see him do this so easy just once there would be no such thing as hiring you to get along without compressed air—and plenty of it too—in all parts of the machine room.

Perhaps you don't know it, but some compressed air released in the stuff on hot days as it comes on the machine will lower the temperature so that those delicate color shades can be handled with ease.

In a mill where a man had recently been killed by getting caught in the shafting I found considerable anxiety to prevent, if possible, a future accident of this kind, and the management of the mill had been investigating the matter of putting in stops whereby the entire mill or any portion thereof could at once be stopped by simply pressing a button. There are several instruments on the market—some of them simple, others complicated—for stopping a steam engine from any part of the mill without action by the engineer. Some of these instruments work by compressed air, some by electricity, and some by other means. Some of the best work by means of a weight, the action of which is controlled by electricity. In the mill in question they had already in use a system of electric signals for stopping and starting the power, slowing down, etc. In putting in the new system the old apparatus was allowed to remain complete, and another wire was run all through the mill, close beside the two original wires. Between one old wire and the new one the stop push buttons were arranged, leaving the old buttons for their usual work of stopping, starting, etc.

The new stop is applied to the throttle, or, in the case of the new makes of Corliss and some other engines, to the disconnection of the valve movements, thus cutting off steam instantly and letting the engine stop as quick as the momentum of the moving machinery would allow. In this case, relief valves were placed on either end of the cylinder for fear that the steam or air contained in the cylinder might be compressed up to a dangerous pressure by the fast-moving piston with the valves all closed through the sudden disconnecting of the valve gear.

The addition of another wire to the signal system virtually made a three-wire system of it, and the same battery was used for both sides of the wiring, the old and the new. The middle wire was connected to one terminal of the battery; the other terminal to the other two outside wires. The "emergency" push buttons were covered with bits of glass, to be broken when there was an accident. For this purpose a little cast iron ball, attached to the end of a short string, was suspended beside each signal button for the breaking of the glass without delay in hunting up something for that purpose.

The "electric engine stop," or any other engine stop for that matter, may be applied to water wheels as well as to steam engines. They may also be attached to friction and other forms of cut-off couplings so that a shaft or a section of the power distribution may be stopped at will without closing down the whole mill. These instruments may also be applied to the starting of machinery as well as the stopping, and fire pumps can be controlled in this manner. Two of the "stops" attached to the same machine will allow it to be both started and stopped again at will, and by the use of a small electric motor for the power application the action may be repeated indefinitely.

It was my intention to have made a flying visit to Charles River for the purpose of noting whether or not the would-be paper mill at that place is getting on. It is a slow job for one man to build a paper mill and do all the work himself; still, I don't know but it is a pretty good way as things go nowadays. It gives the owner—who, by the way, is building the mill—something to do, and puts off as long as possible the evil day when the mill will be running and the owner must rustle for orders. By the "self-building" plan the owner knows just where his money goes and how it was expended. He also knows that there is no poor work or material smuggled into the mill—without his knowing it.

It may be that the mill at Charles River, Mass., was never intended for the making of paper for the trade. When the mill is finished, early in the coming century, the trade may one morning be startled to the very centre by the announcement that Mr. Brown has established in his Charles River mill the very latest thing in the line of correspondence schools, and will henceforth teach by mail "The Art of Mill-Building at Home, or Every Man His Own Paper Mill Constructor."

Mr. C. J. Smart, late director of Messrs. T. Owen & Co., Ltd., Cardiff, England, has, we understand, secured the agency for the International Paper Company of New York.

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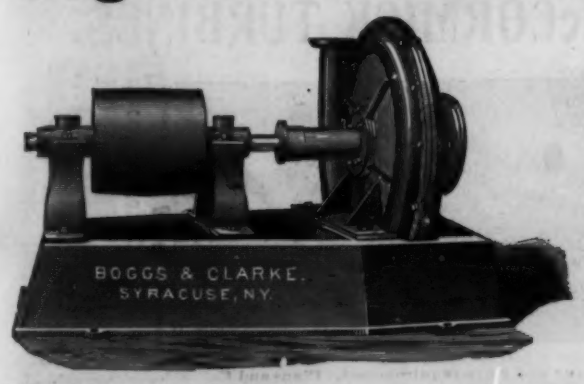

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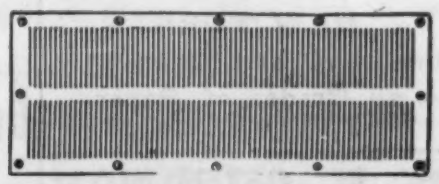

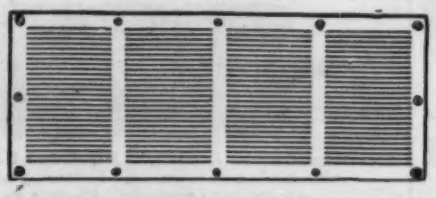

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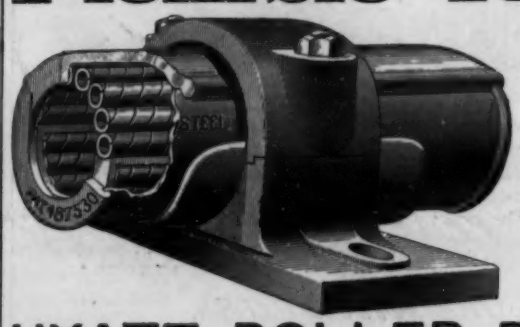

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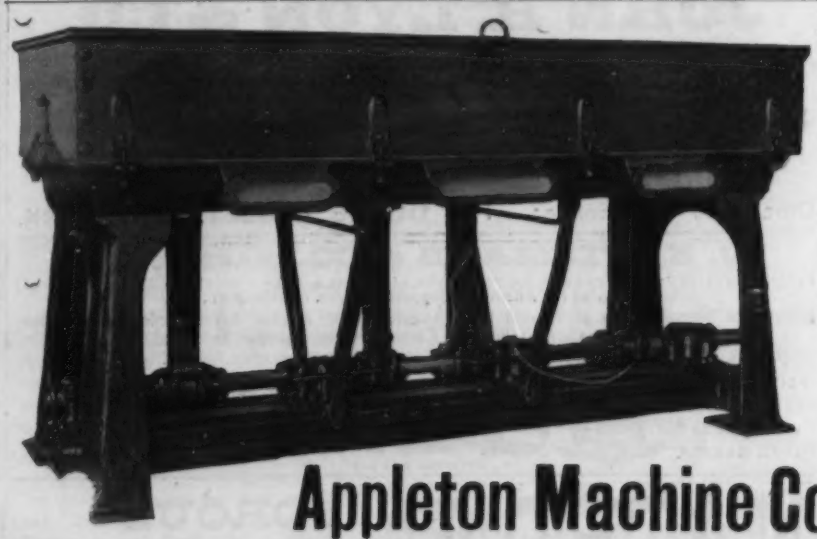

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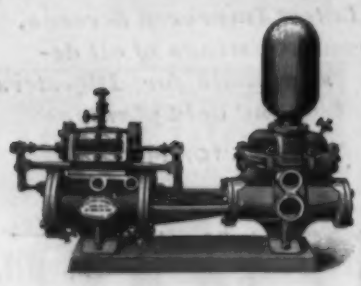

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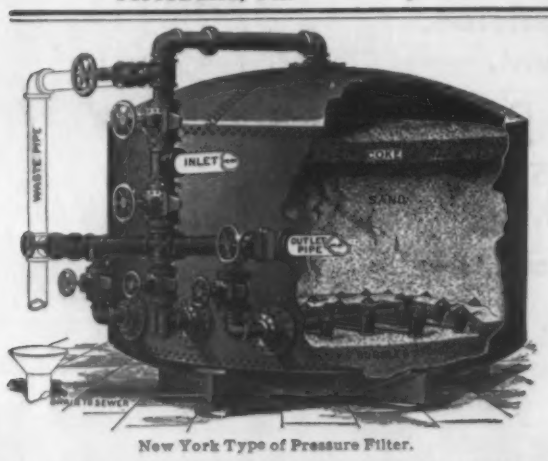

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